



# technology review

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# The Technology Review

VOL. II.

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## HENRY SMITH PRITCHETT

The election of Dr. Henry S. Pritchett, Superintendent of the United States Coast and Geodetic Survey, to the Presidency of the Massachusetts Institute of Technology, was confirmed at a meeting of the Corporation held March 30. He will succeed President Crafts at the beginning of the next school year.

Dr. Pritchett was born April 16, 1857, at Fayette, Missouri, and is the son of Professor C. W. Pritchett, Director of the Morrison Astronomical Observatory at Glasgow in the same State.

His college training was obtained in the local institution in that place, and supplemented in 1876 by study in mathematics and astronomy under Professor Asaph Hall at the Naval Observatory at Washington, and later by study at the University of Munich, leading to the degree of Doctor of Philosophy.

Dr. Pritchett began his professional life as a computer in the Naval Observatory, and on competitive examination he was advanced to the place of assistant astronomer in that observatory in 1878. This place he resigned in 1880 to become astronomer at the Morrison Observatory; and in 1881 he became assistant professor of mathematics and astronomy in the Washington University, St. Louis, and continued on the faculty of that institution until 1897.

In 1882 he was appointed astronomer to the Transit of Venus expedition to New Zealand, and spent the next year in these observations and in pendulum determinations in Australia, India, China, and Japan. In 1884 he became full professor of mathematics and astronomy in Washington University, the chair formerly occupied by Professor William Chauvenet.

The greater part of Dr. Pritchett's professional life has been spent in the service of Washington University, where his work as teacher, as director of the observatory, and as president of the St. Louis Academy of Sciences, has brought him recognition among scientific men in this country and abroad. During this time he has published technical papers giving the results of original work in astronomy and geodesy, and is a member of a number of scientific bodies in Europe and America. At present he represents the United States in the international association for exact measurement of the earth, and will undoubtedly retain this position.

Dr. Pritchett has been called into the government service from time to time to take up special investigations, the results of which have appeared in various publications of the government.

In 1897 Dr. Pritchett was called by the President to the head of the Coast and Geodetic Survey, the oldest scientific department of the government. He took charge of the bureau at a time when it had been demoralized by political interference. He was called upon also to deal with the exigencies arising from the Spanish War and the large increase of coast line of the United States which resulted therefrom. The revision of the very imperfect Spanish charts of Porto Rico has been nearly completed from new surveys. His administration of the office has resulted in



a reorganization of the whole service and the adoption of a plan of work which looks years ahead, and which includes the survey of the new possessions of the United States. His administration of the office has been entirely satisfactory to the Secretary of the Treasury and to the President; and it seems likely that the permanent civil service, with promotion for merit, which is well established in the department, will prove its efficiency so completely as to commend itself to Congress and to the country. The supervision of weights and measures and of electrical standards is also in charge of the Coast Survey, and the duties are yearly demanding a closer scientific supervision.

The Coast Survey was authorized in 1807 under the direction of the Secretary of the Treasury; and work was begun in 1816, naval officers being chiefly employed. Between 1818 and 1832 the survey was directed by the War Department, and little work was done. It was put in charge of the Treasury Department in 1833, and in 1834 transferred to the Navy. In 1836 the Treasury again took control, and the survey was reorganized by a board of which Hassler was chairman. The plans then laid down have since been followed. The title was changed in 1879 to Coast and Geodetic Survey.

Men of high reputation have filled the office of superintendent, and the circumstances which have led to their retirement have been of different kinds, sometimes being due to the inevitable conflict between the man of precise methods and a system of political favoritism; but the place has always been difficult to fill apart from such causes of friction, for the duties of the office not only call for administrative and scientific ability, but also for those rare qualities in dealing with men which procure from legislative committees a recognition of the claims of a great national work of precise scientific measurement.

The list of superintendents includes Hassler, 1816-18 and 1832-43; Bache, 1843-67; Peirce, 1867-74; Patterson, 1874-81; Hilgard, 1881-85; Thorne, 1885-89; Mendenhall, 1889-94; Duffield, 1894-97; Pritchett, 1897-1900.

Professor Pritchett has published a number of papers on astronomical subjects during the last twenty years; and until recently his work, besides these researches, has been devoted to teaching mathematics, engineering, and astronomy. It is scarcely necessary to say that the experience and high reputation gained in these fields, as well as in an important administrative position, are fitting qualities to bring to the new position as the head of the Massachusetts Institute of Technology.

#### LIST OF PAPERS PUBLISHED BY DR. PRITCHETT.

Report on Observations of the Total Eclipse of July 29, 1878. Washington, 1880.

Determination of the Rotation Period of Jupiter from Observations of the Great Red Spot. *Proceedings A. A. A. S.*, 1881.

Observations of the Satellites of Mars. *A. N.*, vol. 91.

Observations of Conjunctions of the Satellites of Saturn. *A. N.*, vol. 92.

A Determination of the Mass of Mars. *A. N.*, vol. 93.

A Determination of the Diameter of Mars from Micrometric Observations, with a Discussion of Systematic Errors. *A. N.*, vol. 97.

Ephemeris of the Satellites of Mars. *Am. Jour. Adv. of Science*, December, 1881.

Observations of Comets. *A. N.*, vol. 99.

Determination of the Longitude of the Mexican National Observatory. *A. J.*, vol. 7.

The Transit of Mercury 1891. *Sidereal Messenger*, vol. 10.

Report of Washington University Eclipse Expedition. *Proc. S. L. Acad. Sci.*, vol. 7.

The Solar Corona of 1889 with Discussion of the Photographs (illustrated). Proc. Ast. Soc. Pacif., vol. 3.

Report on the Determination of Latitude and Longitude of Morrison Observatory. Proc. Morrison Observatory, vol. 1.

A Formula for Predicting the Population of the United States. Proc. S. L. Acad. Sci., 1890. (Reprinted in Proceedings American Statistical Society.)

Observations of Double Stars and Personal Equation in Double Star Measure. Proc. S. L. Acad. Sci., vol. 7.

Eclipses of Saturn's Satellites and their Use in Determining the Planet's Diameter (with tables). Thesis for degree of Doctor of Philosophy, Munich, 1895.

Personal Equation in Time Observations. Astrophysical Journal, 1898.

Lists of Observations of Double Stars, Comets, and Small Planets in the Ast. Nachrichten, and a large number of publications in various Government Reports containing the results of Latitude, Longitude, and Gravity Determinations, Meridian Circle Observations, etc.

A Plan for an International Measurement of an Arc of the Ninety-eighth Meridian. Proc. Royal Soc. Canada, 1899.

## HOUSTON HALL\*

## THE HOUSTON CLUB OF THE UNIVERSITY OF PENNSYLVANIA

Any visitor at the University of Pennsylvania will get an inadequate idea of that famous institution of the Quaker City if he lingers so long in the libraries and laboratories as not to see Houston Hall. If the guide is a student, he is presumably a member of the Houston Club, and will make sure that it is not omitted. If the stranger comes from another college located in a large city, he will surely envy the University this admirable provision for the social life of its students, and may leave it with another hope for the enrichment of the life of his own alma mater. The present undertaking of the Massachusetts Institute of Technology Alumni Association lends additional interest to the study of what has been accomplished at other colleges; and, while in the end the needs of the Institute will necessarily prove not quite identical with those of the University, a comparison of conditions and a careful study of the solution which has been so successful at Philadelphia cannot fail to have great value.

The University of Pennsylvania was founded in 1740, and has at present 2683 students. While located in a large city, it has been fortunate in retaining the ownership of not less than fifty-two acres of land (1897-98), with athletic grounds (Franklin Field) and dormitories. The general effect of its site and spacious detached buildings is distinctly suburban—rather than urban—in about the same degree

\* Acknowledgment is due to the courtesy of the officers of the Houston Club and to Mr. Frederick M. Mann, M. I. T. '94, for highly valued aid in furnishing material for this account of Houston Hall.

as at Harvard or Yale. The need of special provision for the social and physical welfare of its students would then appear to have been much less pressing than it is at the Institute, where space can hardly be found for a tennis court or a bicycle rack, and students can only congregate in each other's way.

The foundation of Houston Hall and what it now is are told in an attractive booklet issued to members of the Houston Club, from which the following account is in substance taken:—

In one of their meetings, held some four or five years ago, a committee of the University branch of the Young Men's Christian Association was called to consider the subject of obtaining a building for the use of its rapidly increasing membership. The committee in question at this particular session numbered just thirteen, and the good luck in odd numbers which has extended down from Christopher Columbus to Rory O'More has been once more amply verified. The proposition laid before the committee was suitably ambitious: it demanded that the University branch should be housed as amply as the parent society at Chestnut and Fifteenth Streets. With this end in view, the work of securing a building fund was started, and reports of slow progress were made to subsequent committee meetings. So slow, indeed, was the progress that, after having obtained the pledges of some six thousand dollars, the hopes of the Association began to waver.

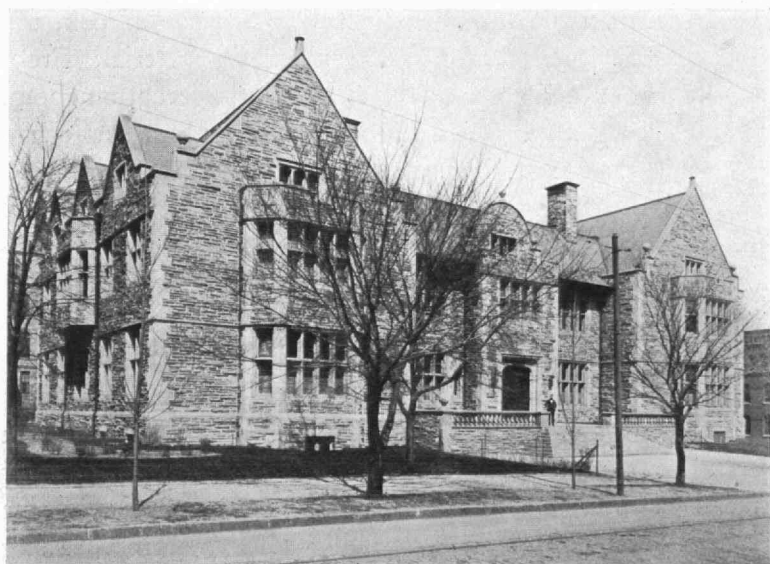
At this stage of affairs one of the trustees of the University, now its popular provost, became interested. Dr. Harrison made investigations as to the sum likely to be needed, and proposed to obtain \$100,000 for this work. To realize this proposal, Dr. Harrison shortly afterward called upon Mr. H. H. Houston, the founder of the

Union Line Express Company, and afterward long identified with the activities of the Pennsylvania Railroad Company. Mr. Houston promptly responded to the call; and it was characteristic of his modesty that he never visited the building during its erection, simply issuing his checks for the money as it was needed in the progress of construction. Before the Hall was finished, the useful life of Mr. Houston came suddenly to its close. His death is too recent to have been forgotten by the community in which it was so important a factor. Dr. Harrison afterward secured from the widow of Mr. Houston a further gift of \$50,000, which was required to complete and furnish the Hall.

About this time, from a spontaneous thought of the original committee, and one which was at once accepted by all who were interested in the work, the new building found its appropriate name. Some years before, Mr. Houston had sent a cherished son to the University, a son of bright promise and large preparation for the future which seemed likely to be pointed out for him. But in advance of the father this son had been called away. The Hall, therefore, came naturally to be regarded as an unconscious memorial of both parents to their child.

The plan of the structure was the result of a competitive effort among architects; and it would seem to have been happily appropriate that the prize was won by two young graduates of the University, who were in hearty sympathy with the undertaking. The location is central, and conveniently surrounded by some of the most attractive features of the campus and the tall buildings which form its border. It is designed in the style which prevailed in England at the time of the transition from the Gothic to the Renaissance. The body of the walls is of a light gray stone,

which comes from the quarry in long, flat pieces. The building has, therefore, a highly stratified appearance; and, the pointing being done in a broad, old-fashioned manner, the stone-work has the effect of great stability. The mullions, transoms, sills, door heads, copings, etc., throughout the building are of Indiana limestone, which has been used



Houston Hall.

in sufficiently liberal quantities to avoid the meagre effect which often results in American renderings of the transition, or Elizabethan, style. The broad, mullioned windows, which are characteristic of this style, have been introduced in such a way as to give the building, not only the appearance of being amply lighted, but to actually insure that result. Carved detail has been sparingly used, and is in evidence only in a few shields bearing the arms of the University and the initials of the donors at various parts of the

exterior, and also has corbels supporting the hood over the doorway, these representing Dante and Virgil. Broad terraces, paved with marble tiles and surrounded with stone balustrades, extend in front of the doorways both on the north and south sides of the building, and afford convenient meeting-places for students in fine weather.

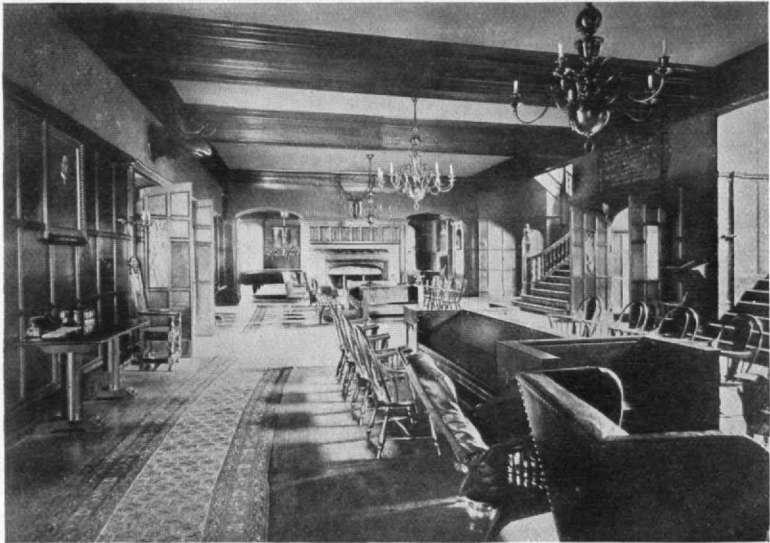
Within the huge doors, at either entrance, is a roomy vestibule, finished with a high wainscoting of panelled oak, and surrounded with seats of the same substantial material. From inner doors one is ushered into the central reception-room. It is massively decorated in solid oak, the tables and chairs and easy seats for loungers being uniform in this respect. Wide fireplaces at either end of the room make the large space doubly inviting in cold weather by their fires of blazing logs. At the east end of this reception-room are two widely arched doorways which lead into the reading and correspondence rooms. These are crowded with ornate decorations, all well in keeping with the prevailing solidity which characterizes the entire structure. The heavy oak pillars and capitals which uphold the mantel-pieces over the broad fireplaces add to the dignity and repose of this most restful and inviting section of the building. Long lines of reading-desks, well stocked with the periodic literature of the day from various quarters of the globe, are well patronized both day and evening. There is a great abundance of the easiest of easy-chairs, in which an average man might almost hide himself from view. There are plenty of quiet nooks where the reader may become a recluse for the time being while pursuing some favorite line of study.

On the western end of the main reception hall is found the billiard, pool, and chess room, furnished with seven of the most approved modern tables for billiards and pool, with a full equipment of chess tables and a profusion of



suitable furniture. On the south front of this door are the business offices of the Club, also a hat and coat room, free for the use of members, an attendant being in charge both day and evening. In the rear of the opposite side are the news-stand, toilet and wash rooms.

Two oaken stairways, as broad and heavy as that which



Main Entrance-room.

Scrooge ascended on his memorable Christmas Eve, lead to the second floor, where the first feature to attract many is the immense fur of a grizzly bear, the head intact, the huge teeth and scarcely less murderous claws being very much in evidence. The second-floor hallway is almost as spacious as the one below. Its walls are surrounded by excellent prints and photographs from the works of famous artists. The furniture is rich and sumptuous, but never unduly prominent. At the eastern end a door opens into the audi-

torium. This fine hall within a hall has space for six hundred people. Like the rest of the building, it is in the style of architecture that prevailed in England at the time of Henry VIII. and Queen Elizabeth, though, of course, a free adaptation, suited to American uses, has been made. The room is finished entirely in quartered white oak, and has a high wainscot and heavily timbered roof, somewhat similar in design to the well-known one at Eltham Palace in Kent. At the north end of the room is a proscenium arch, at the back of which a large pipe organ, with two manuals, and the bellows supplied by an electric dynamo, has been placed at a cost of \$3,500. Here services are held every Wednesday afternoon during the college year, and special care is used to keep these services from becoming monotonous or perfunctory by frequently introducing different speakers to conduct them.

On the western end of this second floor the Athletic Association of the University, the Christian Association, guest chamber, and Secretary's room are clustered; and the main room in front is called the trophy room. This, to many, will be the most interesting apartment in the whole building. Here are displayed, in large, high-framed cases, the almost numberless evidences of victories "by flood and field," which have been won by classes both of earlier and more recent dates. At either end of this very large and beautiful trophy museum are handsome dining-rooms furnished suitably for the use and comfort of the various fraternities, incidental class balls, and other entertainments, for the accommodation of which these features of the Hall are in frequent demand. As an adjunct to these there is an up-to-date kitchen, supplied with all the necessary paraphernalia calculated to bring a smile to the cheek of the most accomplished chef.

The third floor is divided into numerous office, society, and committee rooms. Two of these are occupied by the University's daily and monthly journals, the *Pennsylvanian* and *Red and Blue*. There is a special room set apart for the use of the Camera Club, and in connection with it is one of the best appointed and most convenient dark-rooms



Reception-room.

for developing purposes which can easily be found in any neighborhood. There is a study-room, where, at an annual charge of twenty-five cents for a key, a student can at any time retire for purposes of special study or research. The music-room, which occupies the south-west angle of the third story, is somewhat unlike the rest of the building in architectural character. The room suggests the old inns and dwelling-houses of the Tyrol, and the heavy oak furniture carries out this idea. It is finished in pine, which

has been slightly scorched by a painter's torch before applying a transparent finish. A sombre yet interesting effect is produced in this way. A piano is here provided, and its tones can be heard almost any hour in the day reverberating along the corridors and stairways of the building. There are quite a number of society rooms here, also, which are regularly occupied by the medical, surgical, and dental societies, which hold semi-annual meetings during the season. Going from the top of the Hall to the bottom, we come, in the basement, upon a fresh array of interesting features. A gymnasium with modern appliances, a swimming-pool, a locker-room, barber shop, bowling-alley, café, which attracts numerous patrons, are among the leading attractions of this part of the building.

The art features which are scattered throughout Houston Hall really deserve a separate paper. They are numerous and valuable; and, while perhaps the selection has run too largely into one channel, there are reasons for this, which might not occur to a casual visitor. The thick walls, the dark, sombre expanse of oak panelling throughout the interior, give its two main reception halls a somewhat Rembrandtish appearance during the daytime. It is not until the many electric lights make their appearance that the real cheerfulness of these interiors becomes fully manifest. From this reason, no doubt, it has been found wise to eschew color in the varied procession of works after the great masters which are exhibited in almost every room of the building. There is a large and fine reproduction of that marvellous architectural masterpiece, the cathedral of Amiens, which first came to be known and admired by the untravelled American more than fifty years ago on the pages of Turner's "Rivers of France." Also will be seen an excellent view of the mosque of Cordova. The

list of copies of classic works by Albrecht Dürer, Raphael, Michael Angelo, Titian, Rembrandt, Rubens, Velasquez, Holbein, Donatello, and others is large and interesting. Numerous busts, copied from similar classic sources, fill salient niches in the arched doorways. In the lower recep-



Reading-room.

tion room is an oil portrait of the younger Mr. Houston, for whose memory the building holds its name, and also one of his illustrious father, through whose generosity the building was erected and equipped.

Such is a hasty description of Howard Houston Hall, mainly the result of an individual beneficence wisely directed by one who then and always has held the fortunes of the University of Pennsylvania especially dear. It is naturally a bright and attractive feature of the college campus, and

it may well be doubted whether any of the austerer buildings which surround it is capable of more lasting results. No one can look upon this noble structure, explore its interior, examine the features of its management, or watch the steady stream of bright and happy faces passing through it, the number of which frequently exceeds two thousand per day, without feeling that all its associations and tendencies are in keeping with the purest and best ideals of college life. In its tranquil retiring-rooms study may be wooed with new refreshment by those who may have elsewhere found its pursuit growing monotonous or toilsome. Its provisions for relaxation, for social pleasure, for active exercise, and for intellectual entertainment, are all sought to be in line with the objects of the student's life purpose, while tending to ameliorate the severity of his mental pursuits.

Houston Hall is the home of the Houston Club; that is, the Houston Club is an organization by means of which the University of Pennsylvania students enjoy their privileges in Houston Hall.

The objects of the Club are, as defined in its constitution, "to draw together students, officers, and alumni of all departments of the University in a wholesome social life, and to provide for them suitable amusements and recreations." The undergraduates themselves have control of the establishment with the following restrictions. A Board of Directors is approved and constituted by the Trustees of the University; and this Board appoints a Recording Secretary who is *ex officio* a member of all committees, and is responsible for the care of the property, with authority to order supplies, minor repairs, etc. He has authority over the employees, and receives dues and fees, accounting for the same to the Treasurer. One member of the Univer-

sity Faculty is appointed by the Board of Directors to serve on the House Committee, which makes all rules, has authority to reserve any part of the Hall for special uses, to maintain order, and to exclude any person from Hall privileges.

Membership in committees is based, to some extent, on University departments, club members voting by such departments. Any student, alumnus, or officer of the University may become a member. Active members consist of students or alumni, registered in any department of the University, who have been regularly elected upon the payment of dues. Only active members are entitled to vote or hold office, excepting in special cases.

Dues are as follows: life members, \$20; active and associate resident members, \$2 per year; associate non-resident members, \$1 per year.

Charges are made for the use of rooms, baths, billiards, pool, bowling-alleys, etc.

The house is open during the college year on weekdays from 8 A.M. to 11 P.M. and on Sundays from 2 to 7 P.M.; from June 15 to August 31, from 10 A.M. to 9 P.M. on week-days only.

Alcoholic liquors, betting, games of cards, dogs, and bicycles are excluded.

A discount list, similar to that of the M. I. T. Co-operative Society, is furnished to club members.

The Treasurer's annual report for the year ending April 1, 1899, is as follows:—



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## HOUSTON CLUB, UNIVERSITY OF PENNSYLVANIA

## TREASURER'S ANNUAL REPORT

Cash balance April 1, 1898 . . . . . \$3,343.25

*Receipts during Year*

Membership . . . . .	\$3,789.00	
Recreation . . . . .	5,616.95	
News-stand . . . . .	3,080.49	
Café . . . . .	6,612.34	
Book-room . . . . .	2,878.97	
Other sources . . . . .	2,368.13	24,345.88
Total . . . . .		<u>\$27,689.13</u>

*Expenditures*

Incidental expenses . . . . .	\$171.40	
General expenses . . . . .	2,209.04	
Office . . . . .	400.43	
Pool and billiards . . . . .	353.66	
Bowling . . . . .	95.95	
Baths . . . . .	248.12	
Laundry . . . . .	377.59	
Entertainments . . . . .	128.94	
Reading-room . . . . .	50.84	
Bell Telephone Company . . . . .	109.93	
Central Light and Heat Station . . . . .	2,586.21	
News-stand . . . . .	2,933.98	
Café . . . . .	4,733.23	
Book-room . . . . .	2,495.77	
Wages . . . . .	7,955.14	
Postage . . . . .	136.86	
Bonds . . . . .	15.00	25,002.09
Cash balance April 1, 1899 . . . . .		<u><u>\$2,687.04</u></u>

## SUMMARY

Cash balance . . . . .		\$2,687.04
Stock at news-stand . . . . .	\$816.70	
Stock in book-room . . . . .	332.33	
Accounts due . . . . .	175.38	1,324.41
		<u>\$4,011.45</u>
Unpaid bills . . . . .		1,350.11
Balance . . . . .		<u><u>\$2,661.34</u></u>

As to the question of what the Walker Memorial should be in comparison with Houston Hall, it is evident, in the first place, that the gymnasium element here must be much more emphasized and developed. Our Memorial must be a contribution to the needs of the Institute and its students, and not merely or mainly to their pleasure. It must be remembered that the coefficient of industry is relatively very high at the Institute, and the amount of leisure correspondingly small. Moreover, the Institute has no such previous provision for the physical needs of its students as the University had before Houston Hall was begun.

The question of student government, by the organization of a student club and the payment of a small membership fee which might in special cases be remitted, is an open one of much interest and importance. So, too, is the matter of offering membership, active and associate, to alumni, perhaps with some form of association with the Technology Club.

The Walker Memorial Gymnasium Committee is of opinion that the interests of undergraduates must be maintained as paramount, and that any attempt to serve those of older men at the same time should only be made after most careful study of the problem on all possible sides. The committee takes this opportunity to invite expressions of opinion on these points from the readers of the REVIEW.

H. W. TYLER, '84.

## THE COURSE IN LANDSCAPE ARCHITECTURE

The development of material prosperity in the United States, followed by a wide-spread activity in erecting fine buildings and in decorating them beautifully, has once more proved the truth of Lord Bacon's statement that, "when ages grow to civility and elegancy, men come to build stately sooner than to garden finely, as if gardening were the greater perfection."

Americans have long since realized that, to have fine buildings, they must employ skilled architects, but it is only recently that they have begun to understand that landscape gardening is an art which requires as much study and training as architecture. And because men have "come to build stately," and realize the importance of "gardening finely," there is a constantly increasing demand for landscape architects.

There always has been and there probably always will be a number of able engineers, architects, and horticulturists who have drifted into the profession of landscape gardening; and there are others who will always believe that the sphere of the landscape architect is confined to beautifying roads and bridges, improving the surroundings of a building, or grouping rare plants so as to produce a pleasing effect. Actually, the field of landscape art is far broader than that, requiring a knowledge of many things and nowhere drawing a line between itself and other arts and professions. Because the landscape architect should be a civil engineer, an architect, and an expert gardener, or at least be as thoroughly grounded as is possible for one man to be in the

principles of all three professions, it is a mistake to suppose that his education can stop there. Landscape architecture requires a special training, and, not being a branch of any other art, ought not to be treated as a specialization of some other profession. But, because it has so much in common with these professions already mentioned, it can best be taught in fellowship with them; and therein lies the exceptional advantage in teaching landscape architecture where there are already well-founded courses in architecture and in civil engineering.

In Paris, where the academic system of teaching art has been worked out so carefully that France is now admitted to be the centre of the art students' world, painters, sculptors, and architects all work under the same roof; and at the *École des Beaux-Arts* the sculptor and painter have to take a course in architecture, and the architect and the painter have to learn to model. Surely, much of the good that comes from the French method is due to this broadening education. In the age of Pericles and at the time of the Italian Renaissance the different arts were studied side by side; and what proved wise in Greece, in Italy, and in France, will be found best in America to-day.

The new course in landscape architecture at the Institute of Technology is at present classified as an option in the architectural course; but, though classified with that department, the subjects to be studied are well distributed among several other groups. From the beginning of the second year, when the student is for the first time allowed to specialize, he is trained in drawing, in architectural design, in the principles of art in general, and in the art of landscape design in particular. Through the third and fourth years he is kept studying examples, drawing, designing, creating, analyzing results, solving problems simi-

lar to those he will meet during his professional career, working side by side with the architect, as he will be called on to do later in life, studying civil engineering, so that he may be able to design appropriately and execute his conceptions properly, and combining with all this a thorough course in the use and habits of plants.

It is fortunate that the Architectural Department of the Institute of Technology is so well organized and so successful in its results, because many artistic principles are common to both architecture and landscape gardening, and many of the practical problems to be solved are alike in both cases. Not only do the architect and the landscape gardener work out problems in much the same way, but there is the distinct advantage of a healthy competition in having the two groups of students study drawing, water-color, pen and ink, perspective, and the history of art side by side.

What is true of the Architectural Department is, in turn, true of the courses in engineering. A student must be able to survey and make topographical drawings, he must understand the principles of highway engineering and of bridge building, of estimating quantities, and of properly draining land.

But, besides all this, it is of the utmost importance that the student should realize from the very beginning that success in all his efforts must depend on a thorough knowledge of trees and plants, and, therefore, his studies at the Arnold Arboretum extend through the whole course; for he must learn the identification and the habits of trees, shrubs, and herbaceous plants, and he must also, by a long-continued study of many examples, learn their æsthetic value under varying conditions and at different seasons.

During the winter, instruction in dendrology will be

given by lectures at the Institute; while during the spring and autumn the students will work among the living plants at the Arnold Arboretum, and visits will be made to other places in the vicinity of Boston, where the best examples for studying certain branches of dendrology and horticulture can be found. In the Arnold Arboretum itself the student has a well-classified museum of trees and shrubs, where he can at all times carry on his studies; while the country places in the neighborhood of Boston and the admirable Metropolitan system of parks contains many examples of what is best in landscape art.

While the student is observing the effects that nature produces, while he is learning the constructive side in the engineering courses, while he is learning to draw and compose, he is being drilled in using his knowledge at the drawing-board. For, though the eye be well trained and the mind well stocked, the student must be able to summarize his knowledge in designing; and skill in design is the result of constant practice.

The course was laid out after consultation with the leading landscape architects of the country, and it is interesting to note that there was but little difference of opinion about the choice of subjects to be studied. Thanks to many suggestions, to many discussions, and to the kindly interest shown by many experts, the course has been so arranged that it promises to give the student a sound education in landscape architecture. The work is necessarily hard, and the years of study long; for much is required of the landscape architect to-day. And yet the student should remember that he must in every way avoid a narrow life, or a narrow point of view; for the problems to be solved are many and complex, and his noblest mission should always be to bring the love of nature nearer to the hearts of the people.

GUY LOWELL, '94.

## THE COURSE IN MECHANICAL ENGINEERING AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The practical problems of the business world soon determine the value of a technical training; and, although the execution of the work depends upon a personal equation, there is a strong factor derived from a methodical system of education.

The graduate in the course of Mechanical Engineering finds a field of wide range for active work, and the lines of specialties multiplying greatly with the development of trade interests. The days when engineers were classed in two divisions only, as military and civil, are but a few years passed; yet already the Mechanical Engineer requires a qualifying title to his own degree.

With the vast amount of technical knowledge at the present time and the endless divisions and subdivisions of professional work, one soon decides that a certain path should be outlined, and that the energies should be concentrated along special lines. Not that general studies and interest should be neglected; but, like the modern machine tool, there should be a plan for utmost efficiency and greatest economy for the development along well-defined lines.

Having realized the importance of concentration, we must devise every possible means to facilitate our work, to keep pace with the exacting requirements of modern construction. Some graduates are fortunate in keeping touch with the branches of mathematics so soundly presented to us in the Mechanical Engineering Course, and so are able



promptly to apply the formulæ presented in our text-books; but, in the whirl of business contracts, the atmosphere is not conducive to agility in Calculus gymnastics; hence we integrate with a polar planimeter, and are apt to find the strength of shafting from one of William Cox's convenient slide scales. This is not a plea for any less Calculus, but a suggestion that some of the greatest helps in designing are found in these readily applied devices, and that some attention should be given to proper instruction in their various applications. It is of course acknowledged that a proper understanding of such aids is derived from a thorough study of the higher mathematics; but, so many times, prompt assistance comes from some convenient formula, expressed in few terms, which has been given us during the instruction of student days.

Such hand-books as those compiled by William Kent, for the mechanical engineer, are great helps in practical designing; and this work would be an excellent standard book of reference for every student, so used that by the end of the fourth year he should have become familiar with all the convenient tables.

In nearly every designing room, tables, curves, and diagrams become a necessity for prompt reference; and could such work be included in the course of Machine Design, and in similar studies, the student would then appreciate the value of a systematic arrangement of parts, and of the relative values of variables in the form of curves or diagrams, which have an astonishing advantage over columns or tables of figures.

Such work soon proves the saving that can be made in computations by the use of the slide scale. These instruments are made in every convenient form, and, with a little study and persistent application, become great economizers

of time. While it is true that results, read from these scales, may not be sufficiently accurate in many careful investigations, yet most problems in daily practice may be solved with sufficient accuracy. The special scales designed for strength of shafting, gearing, and belting, are great aids, if properly checked for accuracy in relation to the particular class of work in hand.

One point, which should be drilled into every student from the hour he enters his course, is system in keeping notes. If a standard size of note-book could be adopted throughout the various departments, and made of suitable paper and binding for long service, such a collection would prove a valuable addition to one's technical library, for use in after years of professional practice. The system and use of the Card Catalogue is another subject to be studied, and should be presented to the student in the first year for the practice and systematic accumulation of data.

The course of study in "Business Law" is a most important addition, and will surely receive indorsement from every graduate. In the execution of many engineering enterprises, fully as much depends upon the interpretation of contracts and relations of promoter, contractor, and engineer as in the practical execution of details. It would seem that proper forms of specification and practice in the compiling of specifications would be an excellent feature in this course. One may believe he understands all the details of a certain construction; but, when a description of its execution must be written in such terms as to be plainly interpreted by others, at once a field is found for the most careful study.

Other studies to be commended are those relating to "Industrial History and Management." Of all the departments in the great organization of modern works, that

of "Industrial Management" must receive the most profound study. Where the manner of performing certain lines of work may mean a change from loss to profit, then the importance of this particular training to the engineer who assumes the duties of a manager must be evident. One of the most necessary details in the duties of the management is the accurate determination of shop costs of operations; in detail, as well as in gross, the proper relation of expense in one department to another being shown, and a system which will promptly indicate where a disturbing element exists being devised. There are plenty of systems which may determine such costs at some distant day; but one which will produce results promptly and accurately, with proper attention to market fluctuations of crude materials, is greatly desired and worthy the attention of every engineer. The use of scale diagrams, to show the variations of labor, material, and fixed costs, becomes of great importance in connection with the determining of shop costs. Such questions are becoming so important to every engineer in charge of works that lectures from those occupying such positions would prove a great benefit to students.

In the daily practice of every graduate there are many subjects which would form excellent matter for theses; and if such could be presented to the various courses, with properly designated lines for experimental determination, the Seniors in the Theses of the Fourth Year could give some valuable information. Abstracts of Theses, containing the important determinations and suitable formulæ, diagrams, or tables of results would no doubt receive financial support from graduates in similar lines of work.

Examination of the schedules of studies in the Mechanical Engineering Course shows splendid progress and great care

displayed in the selection of subjects which will best assist the Mechanical Engineer in the practice of his profession. Many of us have occasion to pursue different paths from those which were at first contemplated, and we honor those whose careful schooling has prepared us to undertake systematic investigation of any kind. The opportunities of the Mechanical Engineer are many; and let us hope that symmetry of design, a thorough execution of details, and honest systems of administration on the part of every graduate will bear increasing testimony to the sound methods of training followed by our Alma Mater.

FRANK E. SHEPARD, '87,

*President Denver Engineering Works, Denver, Col.*

## EDITORIALS

The Committee on Publication make no apology for the lateness of the April number, since this delay enables the REVIEW to present a portrait of President-elect Pritchett and a sketch of his career. The unanimous choice of Dr. Pritchett by the Corporation has been received with the greatest satisfaction both within and without the Institute. A man of delightful personality, of enthusiasm, of good judgment, of tact, of courage, his training as a man of science, as a professor at St. Louis, and as an administrator of one of the most important departments at Washington, has peculiarly fitted him for the high position to which he has been called. The Institute of Technology has been singularly fortunate in finding and securing such an admirable successor to the line of distinguished Presidents who have done so much to establish and extend her fame.

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A recent English journal published a comparison of the gifts to education, during the last twenty years, in Great Britain and the United States. The showing is astonishingly in favor of our own country, more being given in one year here than in two decades in England. Many British schools and colleges are possessed of enormous fifteenth-century endowments, the revenues of not a few of which go to lecturers who talk to empty benches upon subjects that had lost all interest two hundred years ago. Most of these English "foundations" were given as a supposed equivalent in cash for the past sins or the future bliss of their centuries-dead givers. Spiritual torments having lost their influence as spurs to liberality, however, no other incentive seems as yet to have arisen to make the Englishman, in any degree comparable with the modern American, generous to education. Are we to infer, then, that the lavish gifts of the United States are made in penance or propitiation?

Far from it. The stupendous sums that every year are poured into schools, colleges, libraries, museums, and other institutions of education in America are, almost without exception, a free and spontaneous expression of real interest and belief in the work of education. As such, they are striking evidence of that unique combination of the practical and the ideal which makes the American millionaire a puzzle to foreigners and an uncertainty even to his countrymen.

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This almost whimsical cast of mind, by reason of which the average American of wealth is intensely practical in the making of his money, but glowingly ideal in the spending of large portions of it, made the Institute of Technology possible. President Rogers was more than an idealist, he was a seer. So that, long before the college existed even on paper, he grasped the whole of what the Institute may yet become. And his wonderful personality and the faith that men had in him helped greatly to make this vision partly seen by others. Had it not been, however, for this leaven of ideality in the "practical" men of New England, the men from whom the money and the influence must come, the vision would have been far longer in reaching realization. The practical side of these early founders showed them the need of young men technically trained; but only an ideal side could have consented so unanimously to such a broad, elaborate, and complex means of filling that need as President Rogers's "Plan" proposed.

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The Institute which was created by their courage and their faith has kept very remarkably a true balance between the practical and the ideal, never sacrificing knowledge to "knacks" or facts to speculation. But before its work is complete, with even human completeness, it has still far to go along the two roads of the ideal and the practical. It has now occupied the middle territory pretty completely; but the regions, on the one hand, of pure science, of extensive research, and, on the other hand, of popular usefulness,

of what it is the fashion to call "university extension," are still largely ahead of it. Not only must its teachers and students have more time for that work in pure science which, eventually, from every point of view, is the most profitable of all work, but it must build up within itself an ever-enlarging body of men, from all quarters, who use the Institute and its notable resources for no other purposes than for those of pure research. And the same combination of the practical and the ideal in Boston's merchants and manufacturers which made the Institute possible will gladly, indeed eagerly, endow these searchers, these explorers of territory yet so little known, with the money, the material, the facilities, that they will need. The intrinsic value of this future work in pure science cannot be estimated, but no less important will be its influence in uplifting and stimulating the entire atmosphere of the college.

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For it will make for breadth of understanding, for completeness of view; and the key-note of all collegiate development to-day is breadth. The classical colleges are fast widening their scope into the regions of science and the useful arts; the colleges of applied science, at the same time, are broadening into the fields of pure science and the humanities. Eventually, both will meet upon a plane of work and aspiration far higher than either of them has yet attained. The classical college which does not modify the ancient curriculum to the needs of modern life is as dead as Aristotle, however gracefully the ivy of sentimental prestige may cling to its intellectual ruins. But the college of technology that does not build its foundations deep in pure science, and round out its work with a liberal allowance of the human studies of history, of literature, of social and political economy, is an educational ruin, too, with not even a spray of the ivy of tradition to cover its naked crudity, its shaking, half-finished towers, its staring windows out of which no completely educated man has ever looked. No matter what the exigency, the Corporation and Faculty of the Institute of Technology have never sacrificed in the slightest degree this essential

quality of breadth, have never lost sight of the fact that their graduates cannot be professionally successful, with an enduring success, unless they have been soundly educated in other than mere technical directions.

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Had the efforts of the President and Executive Committee to secure the Franklin Fund met with the success which it merited, that other undeveloped side of the Institute's work, the spreading of its good influence among the people, might have been in great degree realized, while at the same time the real intention of Franklin would have been carried out. Perhaps even now this Fund, which seems as yet without definite destination, may be given to the Institute as a nucleus for a great Franklin Building for the encouragement and instruction of intelligent mechanics. Or, in time, funds from other sources may come to the Institute for the development, along proper, conservative, and useful lines, of this most important side of technological work.

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While there never was yet a boy who did not delight to play the soldier and to inflame the neighbors, just as savages agitate their enemies, by the beating of drums and the firing of toy guns, the majority of college youth chafe under the disillusionment of semi-weekly military drill. Perhaps the democratic spirit of the collegian resents the fact that only a limited number of men can be commissioned officers; perhaps, even in the midst of wars and the rumors of more wars, he cannot see the immediate usefulness of this salutary exercise; perhaps it simply is that the youth of eighteen is constitutionally lazy. In all of these events it is clear that military drill is an excellent and much-needed tonic for the untamed Freshman, a superlative means of attaining that manly development which is one of the important ends for a college to achieve. The habit of implicit obedience is a sadly neglected one in American households, and cannot be too early remedied, since obedience of one kind or another is the main law



of life. The lifting of the chin, the squaring of the shoulders, the enforced neatness, the precision of movement, all are as good for the inner as they are for the outer man. The experience of concerted action, the sense of homogeneity, are matters almost lost sight of in the modern college, with its thousands of students, though they were and are among the chief sources of strength of the small college, with its two or three hundred youth.

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Therefore, while the instruction of students for all time in the arts of war seems perhaps a large interest to pay for the small interest which the national government exhibited in the Institute by giving it only one-third of the National Land Grant, the Washington authorities seem in this case to have exhibited unwonted wisdom; for they have made easy and logical the path toward compulsory physical exercise when the time shall come to follow it. Just at this moment the educational pendulum is at the point of extreme *laissez-faire*. The student is supposed to have an intuition of what and when he ought to study; and, if this intuition fails, the college waives all obligation, the right things having been there for him to study, had he not chosen to pursue the wrong. But this phase (to which the Institute has never yielded) will pass; and it will then be seen that not only does a student's mind need guidance through the maze of human knowledge, and an ordered variety of exercise in the different modes of thought, but that his body, also, requires to be taught how to pick out the best health from all the degrees of bad and indifferent health, and that his limbs and organs need a judicious and regular variety of exercise, which only an expert is competent to prescribe and which only such compulsion as is used in the matter of his lectures and recitations is equal to enforcing.

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A recent letter from Mr. Soubashew, Director of the Imperial Institute of Technology at Tomsk, Russia, shows how world-wide the reputation of the laboratories of the Institute has become. Mr. Soubashew writes: —

“Next year there is to be opened at Tomsk the Imperial Technological Institute, and shortly there will be added to it a metallurgical laboratory. The world-wide reputation which the Massachusetts Institute of Technology and its laboratory enjoy engages me to address to you the humble request to afford me some particulars concerning the Institute under your direction, as well as its laboratory, hoping that particularly the celebrated metallurgical laboratory will also serve in our country as a pattern example for such kinds of institutions. Especially desirable would be plans and a possibly exact description of the arrangement of this laboratory, as well as a statement of the work carried on there by the students.”

## GENERAL INSTITUTE NEWS

The first quarter of the calendar year, while not one of inactivity at the Institute, is usually uneventful. The Faculty is largely occupied in January with the laborious process of "stock taking"; that is, in attempting to determine, on the basis of many thousand C's, P's, L's, D's, and F's, what work students shall be allowed to undertake during the second half of the year. To those by whom the Institute is esteemed to be an easy place to get into, but a hard one to stay in, it may seem surprising that at the end of last term only nine students were dismissed, ten others being advised, but not required, to withdraw. These nineteen, however, represent, to some extent, "the simple who pass on and are punished," a certain number of the more prudent having preferred to withdraw voluntarily while they still had the option to do so. The second term was opened with the usual demonstrations of student aptitude for handing in revised attendance cards and rushing into the largest sections.

Professor Chandler, after suffering much in health during the first term, had been persuaded to seek relief in a journey to the Bahamas, and returned to his Institute work much refreshed.

## MILITARY DRILL

Military affairs have unfortunately required more than ordinary attention on the part of the Faculty. Too large a proportion of the first-year students have failed to recognize that disorder in the lecture-room and the armory would have other and more serious consequences than the immediate unpleasantness for the instructor. The action of the Faculty in placing several students on probation has tended to create a better sense of individual responsibility on the part of the students, while the application of the class as a whole for the resumption of lectures, which

were temporarily discontinued, should strengthen that proper class spirit which may regulate the conduct of the individual student, and is at once so important and so hard to develop under Institute conditions.

#### LANDSCAPE ARCHITECTURE

The new option in Landscape Architecture, of which a fuller account appears on another page, has been received with adequate favor. On account of the necessarily short notification to the students, several have preferred not to register at once for the new option, but have combined the work in Horticulture, given by Mr. Lowell and Mr. Jack, with the old course IV. Inquiries have been received from several Institute graduates desiring to secure additional training for landscape work.

Mr. Lowell graduated in Architecture at the Institute in 1894, having taken his A.B. at Harvard two years earlier. On graduation he went to Paris for further study, and took his diploma at the *École des Beaux-Arts* last year. In accordance with the French custom, Mr. Lowell worked at the same time in the office of André, the chief authority on landscape gardening in France. He was able at the same time to follow André's course on landscape gardening at the School of Horticulture at Versailles,—a particular privilege involving his appointment as "instructor," the school not being open to foreigners. Besides travelling through a large part of Europe, Mr. Lowell spent a summer studying in Kew Gardens.

#### DOUBLE DEGREES

The question of simultaneous graduation in two departments has again occupied the attention of the Faculty. After much discussion it has been voted: first, that applications for graduation in two or more departments in the same year shall be granted only in cases of students who have previously anticipated fourth-year subjects, in one or both of the courses in question, to such an extent that they have ample time for the work proposed; second, that students, graduating in one or more than one course at the same time, shall

receive but one diploma, which shall, however, state the several courses in which they graduate; third, that no student shall be allowed to present two theses in the same term.

#### THE CORPORATION

The two hundred and eightieth meeting of the Corporation was held at the Institute, Wednesday, March 14. Reports of Departmental Visiting Committees were presented, as follows: Architecture; Mathematics; Mechanical Engineering; Naval Architecture; and Physics. Degrees were conferred on Arthur Little Hamilton in the Department of Mining Engineering and Edward Herbert in the Department of Electrical Engineering.

The two hundred and eighty-first meeting was held at the Institute, March 30. It was voted to confirm the appointment, by the Executive Committee, of Dr. Henry S. Pritchett as President of the Institute, to take effect at the beginning of the next school year.

#### METALLOGRAPHY

Metallography is a subject which has been receiving much attention recently at the Massachusetts Institute of Technology. The science, although established some years ago, has been developed only within the last ten years. The opportunity for the application of metallography in the iron and steel industries is very great, and the Institute of Technology is among the first to introduce a course in the subject for students of chemistry and metallurgy. The lectures on the subject are given by Mr. Albert Sauveur, a graduate of the Institute of the class of 1889, who is director of the Boston Testing Laboratories. The laboratory work is under the direction of Dr. Henry Fay. Up to the present, most of the laboratory work has been of the nature of investigation by students who have incorporated their results into graduating theses. At present an investigation is in progress the results of which will be of value to makers of boiler tubes. Samples of tubing which have been subjected to a great variety of

conditions are being studied. The examination of these specimens will show the effect that the various processes used in the manufacture of such material have on the finished article, and will indicate what treatment is harmful to the life of the tube. Another subject under investigation, which possesses a theoretical interest only, but one of importance, is the isomorphism of selenium and tellurium. The question has been attacked from the standpoint of crystallography, the best method to use in such cases, but with negative results. It is hoped that the application of the principles of metallography will decide the question definitely. Graduates of the Institute who have paid attention to metallography as students are applying their knowledge successfully in the iron and steel industry. They keep in touch with the Institute, and propose practical problems, which have come under their observation, for investigation in the laboratories of the Institute, which are amply equipped for such work.

#### THE INSTRUCTING STAFF

Mr. L. J. Seidensticker, formerly assistant in chemistry, has resigned, to go to Cuba as chemist for a large plantation belonging to the Soledad Estate, Cienfuegos. Mr. Seidensticker will study improved methods for the manufacture of sugar, and will devote a part of his time to the investigation of problems connected with the fertilization of a soil which produces sugar-cane.

Mr. George W. Rolfe, instructor in sugar analysis, has been granted a leave of absence for the rest of the year in order to go to Porto Rico to superintend the taking in of a crop of sugar-cane. Mr. Rolfe has had a wide experience in work of this class, and has spent much time in the study of the carbohydrates. He has been head chemist for a glucose company, has spent two years in Cuba directing the work on sugar plantations, and has carried out a number of investigations on starch, cellulose, and sugar.

Mr. Joseph W. Phelan, instructor in chemistry, will also spend the rest of the year in Porto Rico, investigating a number of problems connected with the production of sugar-cane.

Captain Zalinski, U.S.A. (retired), for a number of years Professor of Military Science at the Institute, lectured to the class of 1903 at one of their regular exercises, Saturday, March 24. Captain Zalinski has been giving a course in the Lowell Institute.

#### CANADIAN SOCIETY OF CIVIL ENGINEERS

The Canadian Society of Civil Engineers paid a visit to the Institute on February 1, this being one of the excursions arranged for them during their annual excursion held in Boston this year. They visited the mining, physical, and engineering laboratories, and in the latter had an opportunity to see a column tested in the large Emery testing-machine. They were also given an opportunity to see the equipment and an exhibit of the work of the department of civil engineering. The management of all of the excursions of this society, covering these days, was in the hands of Leonard Metcalf, '92, as chairman of the Excursion Committee of the Boston Society of Engineers.

#### BOSTON SOCIETY OF CIVIL ENGINEERS

The Boston Society of Civil Engineers held its annual meeting March 22, 1900. A paper was read by Professor C. Frank Allen, M. I. T. '72. Frank W. Hodgdon, M. I. T. '76, was elected vice-president; S. Everett Tinkham, M. I. T. '73, secretary; and Louis F. Cutter, M. I. T. '86, librarian.

## THE UNDERGRADUATES

A dance was given Thursday evening, February 15, by the Architectural Society of the Institute in the studio at the top of the Architectural Building, made brilliant for the occasion by an attractive decoration of scarlet and white bunting, with numerous improvised Oriental alcoves at either side of the room. The ladies of the receiving party were Mrs. James Mason Crafts, Mrs. Francis W. Chandler, and Mrs. Desiré Despradelle.

"Tech" men are much in demand for amateur theatricals. J. S. Bleecker, the giant Queen Anne of the Cadet show, is a "Tech" man; and Allan Rowe, also a Technology student, was in the cast of "A Bit of Instruction" at the Rachel Noah benefit.

At a meeting of the Mining Engineering Society, President Clary, '00, and Vice-President Dart, '00, resigned because of their inability to devote as much time to the interests of the society as it deserved. On this account it was decided to hold the annual election of officers at that time instead of later in the year. The following officers were elected: F. D. Rash, '01, president; F. H. Sexton, '01, vice-president and treasurer; P. E. Chalifoux, '02, secretary; W. W. Garrett, '01, and C. A. Sawyer, Jr., '02, Executive Committee.

## CLASS DAY OFFICERS

The Class Day officers for 1900 are as follows:—

President, Clifford Milton Leonard, of Chicago, Ill.; First Marshal, Percy Rolfe Ziegler, of Roxbury; Second Marshal, Walter L. Rapp, of Cincinnati, Ohio; Third Marshal, Marcy Leavenworth Sperry, of New York City; Historian, Herbert Milton McMaster, of Portland, Ore.; Poet, Herbert Holmes Howe, of Brookline; Orator, Charles Van Merrick, of Syracuse, N.Y.; Prophet, Frederick Hosmer Cooke, of Cincinnati, Ohio; Statistician, Newitt Jackson Neall, of Philadelphia, Penn.



## CLASS DINNERS

The class of 1901 held their class dinner at the Hotel Thorndike, March 16, 1900; and it was the largest and one of the most successful class dinners that the Institute has given. Ralph Plumb acted as toastmaster, V. Frank Holmes spoke on "The Class," Herbert H. Kennedy on "Love," Ray Murray on "Athletics," James T. Scully on "Technique," and William T. Aldrich gave the class prophecy.

The annual dinner of the class of 1902 took place March 10, at Hotel Vendome, fifty-six members present. The toastmaster was Walter H. Simpson, and he was a good one. The annual address was made by Harold Otis Bosworth, I. Rayne Adams discussed "Technique," Alfred William Friend retailed a fine lot of class anecdotes, George Tilley Seabury discussed athletics in a broad and general way, Paul Ernest Chalifoux indulged in "Sparkling Generalities," and Claude Eldred Patch related experiences of his own upon the tented field during the late unpleasantness in Cuba.

There was plenty of excellent music rendered by banjo and guitar in the hands of Donald Minor Belcher, Kenneth Lockett, Arthur Harold Sawyer, Robert Louis Kruse, and Frederick Arthur Poole; while Henry Keene Hooker, a bass soloist, "like a copious river poured his song," according to the printed programme of the evening.

The front page of the menu card, which, according to one of the boys, was "a bute," was from the facile pen of A. H. Sawyer, a member of the class, and apparently represented Captain Myles Standish exhibiting a magnificent turkey, fresh from its roost on the bough of a pine-tree, and destined to grace the board at New England's first Thanksgiving dinner.

The class of 1903 made merry at Young's Hotel with songs and toasts, March 17, about seventy-five members being present. Mortimer Yale Ferris acted as toastmaster, and called on R. M. Field, G. B. Seyms, G. B. Wood, and C. J. McIntosh for responses.

## ATHLETICS

The regular annual meeting for the election of officers for the Tennis Association has been held. President Badlam spoke on the condition of the association, and the secretary's report for the year was read. E. G. Thatcher, '01, who was elected president of the New England Tennis League at its formation a short time ago, told of the plans of the league in regard to a spring tournament on the Longwood courts. The election of officers for the coming year resulted as follows: president, Thatcher, '01; vice-president, du Pont, '01; secretary and treasurer, E. H. Cutter, '02; Executive Committee, Danforth, '01, Bradley, '02, Jones, '03, and the other officers.

With the approach of warm weather comes the usual revival of interest in class baseball. Following the custom of former years, the class game this spring will be contested for by the two lower classes. For the Sophomores, eight of last year's team have returned to the Institute; and, although the call for candidates has not been made, several new men have signified their intentions of trying for the team. The fact that between twenty-five and thirty men have been out regularly during the last week, trying for the Freshman team, shows that 1903 appreciates the value of early practice. The candidates are about evenly divided for the different positions; and, considering the earliness of the season, the majority are fielding and throwing exceptionally well. The practising, so far, has been done at Clover Field, as the Oval is yet too soft to play upon. The class game will, in all probability, be played at the South End grounds during the third week of May.

The relay team met Bowdoin at the B. A. A. Meet on February 3, and was beaten by a margin of 25 yards in the slow time of 3 minutes, 17½ seconds. Failure on the part of M. I. T. to do better work can be ascribed to lack of condition, the examination period causing a break in training which plainly affected the work of every man. Almost at the last minute Priest was compelled to give up training, and Pope was substituted.

## THE GRADUATES

## THE ALUMNI ASSOCIATION

The annual meeting of the Alumni Association was held at the Exchange Club, Boston, December 29, President Miller in the chair. Reports were received and accepted from the Executive Committee, Secretary, Committee on the School, Committee on the William Barton Rogers Scholarship Fund, the Advisory Council on Athletics, and the Trustees of the Alumni Fund. The membership of the Association was reported to be 2,050, 10 members having died during the year. 50 persons have become life members, and 49 associate members.

A committee of seven was appointed to consider the question of closer affiliation with the branch Alumni Associations, of which there are now eight in different parts of the country.

The Nominating Committee, in presenting its report in the form of a printed ballot, made the following additional recommendations, which were adopted : —

1. That it be made the practice hereafter for the Secretary of the Association to send out to all members of the same a list of the names of the Nominating Committee as soon as convenient after the said committee have been appointed, in order that the committee may have the benefit of any suggestions which members of the Association may desire to make bearing upon the list of names to be reported by the committee.

2. That it is the sense of the Association that hereafter the custom shall obtain of electing a new President of the Association each year, by reason of the large increase of desirable members who are now added annually to the Association, by the timely recognition of whose merits general interest may be stimulated and worthy honor distributed as frequently as possible among the many deserving of it.

The following officers were elected : president, Edwin C. Miller,

'79; vice-president, Charles T. Main, '76; member of the Executive Committee for two years, Howard C. Forbes, '91; Alumni Committee on the School for three years, John B. Blood, '90; the Committee on Associate Membership for three years, Edward A. Tucker, '95, Henry P. James, '99; members of the Advisory Council on Athletics for three years, John L. Batchelder, Jr., '90.

At the dinner following the meeting 97 members were present, together with the following guests: President Crafts, Messrs. George Wigglesworth and Desmond FitzGerald of the Corporation, Professor Gaetano Lanza, and Professor F. P. Emery of Dartmouth. Most acceptable speeches were made by the President (see January number of the REVIEW, page 30), Mr. FitzGerald, and Professor Emery. Dr. Tyler also presented a report of the Walker Memorial Gymnasium Committee (see the REVIEW for January, page 65).

#### NORTH-WESTERN ALUMNI ASSOCIATION

President I. W. Litchfield writes as follows in regard to the North-western Association: "The thirteenth annual banquet, held at the University Club in Chicago on Saturday, February 3, had the following programme of speeches:—

- "Confessions of a Professor . . . . Prof. W. H. NILES, M. I. T.
- "Twenty-five Years without a Degree . . . . FRANK CONOVER, '76
- "Liquid Air Facts and Fallacies . . Prof. GEORGE W. PATTERSON, Jr., '87
- "Heart to Heart Talks with the Faculty . . COLUMBIA PHONOGRAPH CO.

"It was the best and most satisfactory meeting we ever had. Over one hundred present. Professor Niles received a warm welcome, and made a good speech. Conover's effort was in rhyme. It was witty, and he made some excellent hits. We had forty gallons liquid air shipped from New York,—about twenty-five when it reached Chicago. I gave what was left to Fred Nichols, '88, who entertained the physics teachers of the city with about six gallons of it Monday P.M. Mind you, it was shipped on Thursday from New York. Professor Patterson gave an excellent

demonstration and address. We intend to have a monthly publication soon, very small, of course, and will print his paper. The University Club banquet hall is decorated with the seals of various institutions of learning. That of the Institute was surrounded by a great wreath of green, and electric lights. Mr. Clement Andrews, former Librarian of the Institute, was a guest. Following officers were elected for 1900:—

“I. W. Litchfield, '85, president; E. L. Andrews, '94, vice-president; E. M. Hagar, '93, secretary and treasurer; C. L. Burlingham, '86, L. B. Dixon, '93, and L. K. Yoder, '95, Executive Committee. The supper card was in the form of a calendar, with notice of monthly meetings at the proper dates all through the year. By the way, each man at the banquet had a finger-bowl full of liquid air to play with.

“At our monthly meeting in January, Louis Gathmann, of Washington, D.C., made an address on ‘Powerful Guns.’ He is the inventor of the Gathmann shell. At our March meeting the phonograph cylinders from our friends in Boston gave about thirty of us great pleasure. The interest in the air rather cut into this feature at the banquet, and only a few heard the reproduction then. The addresses were clear, distinct, and heartily appreciated and cheered.

“Next month, April 16, we have a big meeting. Professors Johnson and Fortier, of Milwaukee, will show their new method of wireless telegraphy, which differs in many respects from the Marconi system; Mr. W. A. Pinkerton will talk on some of his experiences; and Dr. Gatling, inventor of the Gatling gun, will also make an address.”

#### THE TECHNOLOGY CLUB

Since the first of January the regular smoke talks of the Club have been continued, and have been well attended. On January 3 (as stated in the January number of the REVIEW) Professor Arlo Bates spoke on “Anglo-Saxon Natural Science.” On January 19 Professor Davis R. Dewey told about the “George Junior Republic,” and showed samples of its money and daily paper. On

February 9 it was planned to have Colonel Curtis Guild and Lieutenant Colonel Butler Ames, '96, give reminiscences of the Spanish War. The evening was pleasantly passed by listening to Colonel Ames, who told of the war in Porto Rico. Colonel Guild, because of an imperative engagement, was obliged to postpone his part until March 2, when he gave a most interesting account of his experiences in Cuba. Ladies were invited to listen to Mr. William Lyman Underwood's lecture, beautifully illustrated with colored lantern slides, at the eighth talk upon "The Children of the Woods." The talk of Mr. Louis F. Cutter, '86, on March 9, was illustrated by many excellent slides made by him while spending a month in Tunis and Algeria. On March 16 Gelett Burgess, '87, "Erstwhile Editor of the *Lark* and Discoverer of the Purple Cow," amused members of the Club and friends with "Some Essays in Enthusiastic Journalism." On March 30 Professor Dana P. Bartlett spoke for the Institute party which visited the Yellowstone Park last summer. Besides the delightfully colored pictures shown by the lantern, there were many taken by members of the party, besides some droll ones, which interested the members gathered to hear the talk. On this evening members of the classes of '85 to '91, inclusive, not members of the club, were invited. The class of '93 has given to the Club-house a beautiful silver punch-bowl and coffee-urn. On February 22 a picture of Mt. Vernon was received from one of the members of the club. A large photograph of ocean surf has been loaned by a member, and is hanging in the reading-room.

## NEWS FROM THE CLASSES

1868.

PROF. R. H. RICHARDS, *Sec.*

Mass. Inst. Technology, Boston.

"Greene's method of analysis, given in his 'Arches,' was used in designing the two latest bridges across the Niagara Gorge, the two-hinged, spandrel-braced arch which has replaced the Grand Trunk Railway suspension bridge, and the eight hundred foot arched rib just below the Falls." The last book, published year before last, by Charles E. Greene, is "Structural Mechanics; or, The Action of Materials under Stress." It contains, among other things, a sample analysis of the stresses in a hollow cylinder, under two opposite forces, applied at the ends of a diameter; the design of the conical or the hemispherical bottom of a tank; and the determination of the stresses in a conical piston,—all of which are original. Soon after graduation from Technology, in '68, he secured a position as assistant engineer on location and construction of an eastern rail-

road. He was later placed in the office of the resident engineer, by whom he was given an opportunity to take part in such changes of the plan as are often made during construction. With the completion of the road he ceased his connection with it. When he was visiting in the East some twenty-seven years later, he heard that the present management of the road had made an attempt to resurvey the right of way through the city of —, a particularly narrow and winding strip, on which it was thought that buildings were encroaching, and that such record as they found did not fit the present line. Half in jest, he suggested that he might perhaps be more successful, as he had made the original location, and had run the final centre line. He was therefore asked to make the attempt. The general manager knew of no plans, papers, or note-books; but the son of one of the original directors remembered there was a shoe-box half-full of old books and papers in a loft over

his store. He hunted up the box; and, after a few minutes' search among what the mice and mildew had spared, he found some old leather-covered notebooks, which he at once recognized as the ones in which he had, long before, made so many notes and sketches in the construction of this railroad. One book proved to contain the original location and the modified line in question. But the problem was not entirely cleared up. In the development of the road and its connections the initial point of the survey had disappeared, and its surroundings were new. The gauge had been reduced, and there were differences of opinion as to which rail had been moved in the change. But in the recovered note-book he found some topographical sketches with distances locating corners of buildings and giving lengths of their sides. Some of these buildings remained in place, and could be identified; and a reversal of the distances located very closely three or four of the original station points. The record of the line itself then enabled the transit man to put it on the ground throughout the entire distance

in question.—James P. Toltman, with his wife and youngest son, started in January on a trip to Italy.

1873.

SAMUEL E. TINKHAM, *Sec.*

City Hall, Boston, Mass.

R. A. Shailer called at the Institute lately, and is planning to send his son to the Institute next year.—The death of Frank Wells, for some years president of the North-western Alumni Association, has been reported.

1874.

CHARLES F. READ, *Sec.*

47 Cypress Street, Brookline, Mass.

John C. Chase is president of "The Chase-Chace Family Association," which has been organized and incorporated for the purpose of inciting interest and aiding in the compilation of a genealogical history of the family.

1875.

E. A. W. HAMMATT, *Sec.*

53 State Street, Boston.

The annual meeting of '75 was held on January 12, 1900, at Young's Hotel, at 7 P.M.,



with Vice-President Beal in the chair. The Committee on Nomination (Messrs. Aspinwall, Lincoln, and Kinnicutt) reported unanimously in favor of the re-election of the old board; and upon ballot the following were declared elected: president, Thomas Hibbard; vice-president, B. L. Beal; secretary and treasurer, E. A. W. Hammatt; Executive Committee, B. L. Beal, C. H. Williams, S. J. Mixer. There were present Messrs. Aspinwall, Atkinson, Beal, Bowers, Dorr, Hammatt, Kinnicutt, Lincoln, Mixer, Stoddard, and Williams. After the dinner, Vice-President Beal said that the occasion called attention to the fact that this was the twenty-fifth year since graduation, and especially regretted the absence of President Hibbard, due to sickness. He introduced the guests of the class; namely, President Crafts, Secretary Tyler, and Professor Sedgwick, and several hours passed in social intercourse. Professor Sedgwick paid a glowing tribute to Classmate Bowers for his work on the driven-well system of water supply for Lowell. The meeting adjourned at 11.30 P.M.—Thomas Hib-

bard, who was quite ill, is recovering.—W. A. Prentiss is planning to send his son to the Institute next year.

1877.

R. A. HALE, *Sec.*

Lawrence, Mass.

The annual meeting of the class was held February 13, 1900, at the Technology Club, with ten members present. Various matters were discussed,—the Walker Memorial Fund, TECHNOLOGY REVIEW, and other matters in a very informal way. Some letters were received from absent members. It was voted to send some flowers to W. E. Chamberlin, who on account of ill-health is unable to attend the meetings. An interesting letter was received from J. E. Hardman, consulting engineer, Montreal, who has made many examinations of mines in British Columbia during the past year. He is president of the Canadian Institute of Mining Engineers.—E. G. Taber is located at Spokane, Wash., engaged in railroad locations; and in various parts of the country new lines are continually being projected and

developed.—Stephen Decatur is located at Portsmouth, N.H.—W. E. Fairbanks, of Caryville, Mass., represents his district in the Massachusetts legislature this year.—C. B. Wheelock, who was with the class of '77 in the mining course for a few months, is located in Boston, on Water Street, as insurance agent.—H. H. Carter, with the Metropolitan Contracting Company, is engaged in some extensive dam construction in Nova Scotia.

1878.

LINWOOD O. TOWNE, *Sec.*

Haverhill, Mass.

The class held its annual reunion and dinner at Young's Hotel, Friday evening, December 29, President C. M. Baker occupying his usual seat at the head of the table. The class never indulges in "exercises" of late years, and the talk during and after dinner was purely informal. Besides the president the other members of the class present were W. B. Allbright, W. B. Bradford, E. P. Collier, A. S. Higgins, C. S. Rackemann, I. Rich, J. W. Rollins, Jr., J. W. Sargent, Professor P. Schwamb, E. F. Williams, L. O.

Towne. — Theodore Bigelow Rollins died suddenly, January 13, from heart failure, resulting from the grip, after a week's illness. Mr. Rollins was born in Chelsea, Mass., Jan. 21, 1857, later moving to Wellesley, and there attending the public schools. He fitted for the Institute at the Allen School, West Newton, passing his examination in June, 1873, and entering the class of '77 in the fall when less than seventeen years of age. The following year he joined '78, remaining with that class two years, taking the course in architecture. He then left the Institute, working for a time in an architect's office, but soon entered the employ of his uncles, E. L. & F. S. Rollins, wall-paper jobbers, Boston. He remained with them seventeen years. At the end of that time the National Wall Paper Corporation was formed, his firm going out of business and Rollins representing (for New England) Fr. Beck & Co., a branch of the new corporation. He was well known and esteemed by men of his own business, who best knew him, and at the time of his death held one of the best positions in New

England in the wall-paper trade. His absence on business at the annual '78 class supper a fortnight before his death alone prevented his usual attendance. In February, 1896, an attack of the grip resulted in his going to Colorado for some months, to return fully recovered. Except the brief annual reunion, we of the class had little chance to know him at his best, as he grew from the boy leaving Tech. at nineteen to his full manhood. Then we knew him as the genial and companionable man of our class, always welcome. Only to those thrown with him in his maturer life can come the knowledge of what he was later to business friends and those within a closer circle. He was pre-eminently a business man, giving to that life the best of himself, working early and late. One lifelong friend writes of him, "Ever true as steel, just and sensible, conscientious and loyal,—all this and more." Another: "I had a profound admiration for his fine and splendid manhood and a great respect for all those quiet, manly ways that were characteristic of him. He represented the New England type at its best. For us

all the world is poorer for his going out of it." This is the first death in our class, known to the secretary, for nearly twenty years, and but the second since graduation. Mr. Rollins was a member of Dalhousie Masonic Lodge, Newtonville. He was married in 1886. Mrs. Rollins and a boy (bearing his name) and girl are left in the Wellesley home.

1882.

WALTER B. SNOW, *Sec.*

Watertown, Mass.

The eighteenth annual dinner of the class was held at the Technology Club on the evening of February 1. The following members were present: French, Gooding, Herrick, Jenkins, H. F. Ross, W. B. Snow, A. W. Walker, and Warren.—Frederic B. Cochran, who is now located at 20 and 22 Broad Street, New York City, is a member of the New York Stock Exchange, and makes a specialty of United States government bonds.—Frederic M. Noa, who was a member of the class during its Freshman year, has been heard from at Buffalo, N.Y. He is seeking a position in the East.—Carson is a regular at-

tendant at the nearly coincident banquets of the North-western Alumni Association.—W. H. V. Rosing was promoted December 1, 1899, to the position of assistant superintendent of machinery of the Illinois Central Railroad. He previously occupied the position of mechanical engineer on the same road.—Frank C. Morrison, late of San Francisco, and Joseph H. Walker, late of Fairport, Kans., have not been heard from in response to recent communications. Any information regarding their present addresses will be appreciated.—Harry G. Manning is at present in Chicago, superintending the completion of a large new plant for the Simonds Manufacturing Company.—Charles D. Jenkins has been appointed lecturer at the Institute for the current year, on illuminating gas and pottery.—Walter H. Hersey is now treasurer of the Roubaix Worsted Mills, Providence, R.I., spinners of French system worsted yarns and worsted merino yarns for weaving and knitting.—Lloyd G. Lewis is no longer with S. N. Breed & Company, but is now connected with the Hutchinson Lumber

Company of Lynn, Mass. His home address is 31 Burrill Avenue, same city.—The address of Harry M. Neff has been changed to 221 Symer Block, Denver, Col.—The home address of John P. Wood is Aernesholt, Wayne, Delaware County, Pa.—John H. Ross is abroad on business for the Boston Thread & Twine Company, of which he is president.—French, Gooding, Jenkins, Snow, W. B., and Walker, A. W., were the representatives of the class at a quiet gathering at the Technology Club on the evening of April 4.—The Cathedral of St. John the Divine, of which Heins & LaFarge are the architects, occupies a commanding position near Morningside Park, on the crest of a high bluff overlooking upper New York and the Hudson River. When completed, it will be about 520 x 296 feet, and have a spire nearly 450 feet high above the main floor and 500 feet above its lowest foundation. Both walls and tower are to be built of massive granite masonry on footings of concrete laid on rock in large pits, which were carried down to a maximum depth of 45 feet below the original sur-

face. Work has been in progress on the cathedral for about five years, but is at present being prosecuted only on the choir at the east end and on that part of the great tower which forms the west end of the choir. The crypt has been finished to form a chapel as large as many churches. It is roofed with a Guastavino arch of about 90 feet span, which is levelled up with concrete and covered with asphalt to receive the pavement of the nave. The *Engineering Record* of March 31 contains an interesting description of this work so far as it has progressed.—Howard K. Blair, who was with the class during a portion of its course, is now located in Denver, Col.

1883.

HARVEY S. CHASE, *Sec.*

8 Congress Street, Boston.

In the fall of 1886, after graduation, Frank Tenney accepted a position with the Pennsylvania Steel Company, and started in as a sort of assistant around the blast furnace department. In the fall of 1885 he was sent by the company to repair and put into operation a small furnace

plant at Ashland, Baltimore County, Md., which had been leased. In the fall of 1886 he was recalled to Steelton, and appointed purchasing agent, which position he held until 1890, when he was detailed to outside work in connection with the management of the company. In 1893 he was appointed assistant superintendent of the company, in which capacity he continued to act until April, 1899, when he was appointed assistant to the president. He was married in 1889. His eldest boy is receiving the elements of knowledge which will some time make him eligible to "Tech."—George J. Foran is still doing business at the old stand, and has gone back to handling Deane & Worthington pumps as well as Blake & Knowles, and is especially engaged in cracking all kinds of pumping and compression nuts, and will be glad to hear from any man who has a conundrum in that line. He is after a good-sized contract for pumping machinery in one of our neighboring cities. If it goes on merits, he will get it.—Frank E. Davis is with the spring wire department of the American Steel &

Wire Company, where he is helping find occupation in that line for several hundred hungry proletariats, so as to keep them out of mischief. In athletics you will find a complete record of his achievements on the tenth page of the Boston *Morning Journal* of November 27, first two columns. Generally speaking, his life has flowed along rather quietly. He did not climb San Juan Hill, and has not become a hero. Nothing short of a gubernatorial job would tempt him in politics; and, financially, he is still chasing the nimble dollar, and has yet a large and varied assortment of room in his coffers.—George A. Smith is still looking after the manufacture of wall paper which, he thinks, is the finest in the country.—Gale is a “sedate Solon” at the General Court, and keeps a warning eye on members of the “Third House.”—Chase has been investigating the accounts of the John P. Squire Company and allied concerns, for the “Committee of Creditors.” At a meeting of the Massachusetts Society of Public Accountants, held March 6, Harvey S. Chase was elected treasurer.

1884.

Dr. AUGUSTUS H. GILL, *Sec.*

Mass. Inst. of Technology, Boston.

The class held its twentieth reunion and dinner at Young's, Wednesday, February 21. For some unexplained reason but nine members were present, which, being no quorum, no business could be transacted. Letters were read from absent members, and a very enjoyable evening passed.—Mellen is president of the Newtowne Club of Cambridge and treasurer of Lever Brothers, Limited, Boston Works, successors to Curtis, Davis & Co.—Haines has just returned from a trip to South America, in the interests of the Johnson Company.—Rich has another boy, Norman T., born October 5, 1899.—C. S. Robinson is general superintendent of the Iron and Steel Department of the Colorado Fuel & Iron Company. He and his brother attended the Washington meeting of the Mining Engineers.—F. H. Newell lectured before the Society of Arts, March 8, on “Water Storage on Gila River, Arizona.”—Bunce is consulting engineer to the O. & N. Tunnel Association

and Rogers Mining Company of Ouray, Colo., in which companies he has an interest.

1885.

A. D. LITTLE, *Sec.*

7 Exchange Place, Boston.

The following notice of the work of F. H. Newell appeared in the *National Geographic Magazine* for November, 1899: "Owing to the press of his official duties as the hydrographer of the United States Geographical Survey, Mr. F. H. Newell has been compelled to resign the secretaryship of the National Geographic Society,—an office which he has so ably and zealously filled during the past two years. As an evidence of his efficient management, dating from December, 1897, it may be stated that the membership of the society has increased from 1,300 to more than 2,200, and has received an impetus that promises in the near future greatly to enlarge that number. Frederick Haynes Newell was born in Bradford, Pa., March 5, 1862. After a course at the common schools of Needham, Mass., he entered the Massachusetts Institute of

Technology at Boston, where he graduated with high honors as a mining engineer in 1885. Several years were passed in miscellaneous engineering in Pennsylvania, Virginia, and various sections of the United States. In 1888 he was appointed hydrographer of the United States Geological Survey, a department then formed for the first time. Since then Mr. Newell has planned and organized the systematic measurement of the flow and capacity of many rivers in arid regions of the West, his object being to ascertain the resources of water available for the gradual reclamation of the vast tracts of desert land. In other words, a great work has been begun and is nearing completion in what Mr. Newell has aptly termed 'The Annexation of the West.' Mr. Newell is the author of 'Agriculture by Irrigation,' 'Hydrography of the United States,' 'The Public Lands of the United States,' etc."—The *Cambridge Tribune* of November 4 and the *Watchman* of October 5, 1899, contain interesting accounts of the experiences and travels of A. C. Fuller as a missionary in India. After travelling through

Japan and China, he settled in a small seacoast village in India named Kottapatam. Two years later he was transferred to Podili, a town of about 4,000 inhabitants and 40 miles inland, where he was given charge of a section of about 500 square miles, in which he was the only white man. At first he lived in tents, but later in a thatch-roofed hut; and not until eighteen months later he was enabled to complete a bungalow. In spite of serious illness and the many obstacles arising from native suspicion, Fuller brought the membership of the churches in his district up to something over 4,500. Such antagonism finally developed, however, between the converts and their Hindoo neighbors as to culminate in several riots, in one of which Fuller nearly lost his life. The ringleaders were arrested, and, after a tedious trial extending over five months, were sent to jail. In 1898, after the district had quieted down, Fuller travelled extensively through Burmah and India, going as far north as the Khyber Pass on the borders of Afghanistan. His present address is 125 Prospect Street, Cambridgeport, Mass.—

Tracy Lyon, II., has been recently made general superintendent of the Chicago Great Western Railway.—Heywood Cochran is temporarily in the office of the Lorain Steel Company at Johnstown, Pa.

1886.

PROF. ARTHUR G. ROBBINS, *Sec.*

Mass. Inst. Tech., Boston.

Mr. H. B. Merriam has been abroad for some months on business for the Sims-Dudley Defence Company, with which he is connected.—Mr. William E. Shepard has left the General Electric Plant in Schenectady to become an engineer with the French Company for the Thomson-Houston System, and is now in Paris.—M. A. Vielé has opened an office in Schenectady, N.Y., as consulting civil and hydraulic engineer.

1887.

EDWARD G. THOMAS, *Sec.*

89 State Street, Boston.

The annual meeting of the class was held February 21 at Young's Hotel. Twenty mem-



bers attended. President Oren S. Hussey, of Nashua, presided at the business meeting, at which the following-named officers were elected: F. M. Wakefield, of Boston, president; H. F. Bryant, of Brookline, and E. A. Haskell, of Springfield, vice-presidents; G. O. Draper, of Hopedale, treasurer; E. G. Thomas, of Boston, secretary.—Henry J. Conant took a brief rest in March at Hot Springs, Va.—Mr. Charles A. Barton is at present with the Canadian General Electric Company in Peterboro, Canada.

1888.

W. G. SNOW, *Sec.*

4 Post-office Square, Boston.

Twenty-two members attended the annual class dinner March 10 at the Technology Club. E. P. Quigley was the banner long-distance man, having come from Birmingham, Ala.—Holman, as usual, came over from New York.—George C. Scales gave a brief account of his recent trip to Porto Rico.—Runkle, who has not met with the class for a number of years, was present. He has returned to Boston, where he is

connected with the National Coal Tar Company.—Incidentally, several new subscribers were obtained for the *TECHNOLOGY REVIEW*.—Guy W. Currier, of Lawrence, is a member of the Massachusetts Senate.—C. H. Cromwell, formerly of Cromwell Brothers, brick manufacturers, Baltimore, Md., is now vice-president of the Lafayette Mill and Lumber Company of the same city.—Benj. C. Lockett, recently of the firm of Smith, Hogg & Gardner, New York, has formed a co-partnership with Charles G. Taylor, of the same city, for handling fine cotton fabrics. The firm is located at 476-478 Browne Street.—The secretary would like the address of Julian V. Wright, formerly of Chicago.—F. R. Nichols has recently brought out a "Manual of Experimental Physics," published by Ginn & Co., Boston.—Mr. Richard Devens has resigned his position as engineer with a railway supply concern in Boston, to take a similar position in a manufacturing firm of London, England.—William H. Gerrish has left the U.S.A. Ordnance Department, and become the mechanical engineer of the Flax

Spinning Company at Paterson, N.J.

1889.

FRANK L. PIERCE, *Sec.*

31 Milk Street, Boston.

John Lawrence Mauran is now St. Louis partner of Shepley, Rutan & Coolidge. In the current number of *Municipal Affairs*, published by the Reform Club of New York, he very clearly states the condition of public art in St. Louis, with necessary methods for urgent improvements.—George F. Russell is superintendent in charge of the Russell Mill, operated by the International Paper Company at Lawrence, Mass.

1890.

GEORGE L. GILMORE, *Sec.*

Lexington, Mass.

The class of '90 is well represented in the Manufacturers' Contracting Company of Newark, N.J. W. H. Fenn is president, Pierre S. du Pont is vice-president, and Guy C. Emerson is the manager of the Boston branch, with an office at 170 Summer Street.—Mr. H. P. Spaulding's exhibition of

water colors in New York has proved very successful, and he will soon have an exhibition in Boston.—George W. Fuller has opened an office as consulting expert in water purification and sewage disposal at 220 Broadway, New York.—A. H. Adams has gone to London to work for the Sturtevant Engineering Company there.

1891.

H. A. FISKE, *Sec.*

93 Water Street, Boston.

W. J. Roberts has been promoted from assistant professor to associate professor of mathematics and civil engineering at Pullman, Wash.—H. W. Jordan has recently left the Solvay Process Company, and is now manager of the Bowker Chemical Company's works at Elizabeth, N.J.—Frank H. Burton is chief draughtsman, Army Transport Service, Army Building, New York.—F. T. Snyder has written an article on "Metallurgic Standards," published in the "Transactions Canadian Mining Institute."—H. A. Fiske has been appointed superintendent of surveys, and placed in charge of the Underwriters'

Bureau of New England. This is an inspection bureau, making a specialty of buildings and factories protected by automatic sprinklers, the bureau being maintained by thirteen of the largest stock fire insurance companies.—The annual class dinner will be held the first or second Saturday in April, and probably at the Technology Club.—Gorham Dana spent Washington's Birthday week at Jackson, N.H., snowshoeing with the Appalachian Mountain Club. Several of the neighboring peaks were ascended, including Washington. He ascended the latter peak, with two others, by way of Tuckerman's Ravine, and had a rather perilous descent over the icy carriage road in the evening, camping at the half-way house over night.—S. Bradley is in the firm of Bradley & Chapman, installing heating and cooking apparatus.—F. H. Rose was married January 31 to Miss Mary C. Upson. The ceremony took place at the home of the bride's parents, 1612 Euclid Avenue, Cleveland, Ohio. Mr. and Mrs. Rose will be at home after April 1, 1922 Euclid Avenue.

1892.

PROF. SEVERANCE BURRAGE, *Sec.*  
Purdue University, Lafayette, Ind.

The members of '92 who attended the annual banquet of the North-western Association of the Alumni of the M. I. T. were Albert Percival Hall, George H. Lukes, Murray Warner, and Severance Burrage. '92 has always created a sensation at these banquets with its rackety-whack yell.—Murray Warner is about to sail for Shanghai, where he will remain in the employ of the American Trading Company.—Theodore H. Skinner was married on February 1 to Miss Viola C. Kelley, of Niagara Falls Centre, Ont.—Hartley Dennett was married on January 20 in King's Chapel, Boston, to Miss Mary C. Ware, of Boston.—Mr. Frank Edson Perkins, assistant professor in charge of the course in Architectural Design at the University of Pennsylvania, was in Boston during the Christmas holidays, and attended the alumni banquet.—Moses Jerome Look of Clinton, assistant engineer at the Metropolitan Water-works, and Miss Amy

Gertrude Wood of Northboro, were married at high noon, Wednesday, Jan. 10, 1900.

1893.

FREDERIC H. FAY, *Sec.*

60 City Hall, Boston.

"Electric Railway Motors," by George T. Hanchett, M.E., just published, is the latest literary effort of a '93 man. A review of the work says: This is a book unique in its treatment of electric railway equipment. The first ten chapters are devoted to minute description of the details of electric railway motors that are in use to-day. Each part of an electric railway motor is taken up in turn, described, and illustrated by examples of present and past practice, and its operation explained in the light of practical experience. In short, the review of current practice is of such a nature as to bring out the reason why the electric railway motor is built as it is to-day. For example, field magnets of different types of motors are illustrated and compared, and their features of merit and faults pointed out. Armatures, armature windings, brush holders,

suspensions, and other details are similarly treated, each detail, however minute, being exhaustively considered. The last two chapters are devoted, one to the management and repair of electric railway motors, and the other to railway motor design, a complete design being worked out as an example. — An interesting letter has recently been received from Toros H. Torossian, describing his experiences in highway construction in Persia. He and his brother are associated in the work, and seem to be well equipped for dealing with the different nationalities they meet, as together they are able to speak English, French, German, Russian, Persian, Turkish, and Armenian. They employ principally the native Persians, and apparently have a strike for higher wages every few days; but this does not greatly disturb them, for, if they do not wish to grant an increase, a short reprimand will usually bring the laborers to terms. In case of serious trouble a few words to the governor will cause him to seize and sell all the donkeys and mules of the workmen, pay the contractor

his damages, and keep the remainder of the proceeds himself, — a method which would doubtless have a decided influence upon strikes in this country as well as in Persia.— On January 20 a dozen members of the class dined together at the Technology Club, and then spent the evening listening to a most enjoyable smoke-talk on Japan by Charles W. Taintor, of Manchester, N.H. The interest in the talk was heightened by the exhibition of a number of lantern slides.— Robert N. Wallis was elected president of the Common Council of the city of Fitchburg, Mass., for the year 1900, receiving sixteen out of the eighteen votes cast for that position.— Henry W. Nichols, assistant curator of geology of the Field Columbian Museum, Chicago, has received the appointment of honorary special agent of the Department of Mines and Metallurgy for the Commissioner-general of the United States to the Paris Exposition. In his latter capacity he has made the collection of lead and zinc ores for the United States Exhibit in the Exposition. Nichols has recently written articles on "The Ores of Colum-

bia," published in the Field Columbian Museum Publications, No. 33, and on "The Marble Collections of the Field Columbian Museum," published in *Stone* for January, 1899.— S. C. Keith, Jr., recently delivered a lecture on bacteria in milk before the Association of Boards of Health of Massachusetts. For several years Keith has held an appointment as lecturer on biological subjects at the Institute, and this year he delivers a course of lectures there on the bacteriology of milk products.— From Mr. and Mrs. Heiichiro Maki, of Tokyo, Japan, is received the announcement of the birth of their daughter, Sidzuko, on June 26, 1899.— Jonathan E. Woodbridge, editor of the *American Electrician*, New York City, was married July 25, 1899, to Miss Ethel M. Hotchkiss.— Frederic P. Simonds is a member of the firm of Stratton & Simonds, architects, 52 Kilby Street, Boston.— George L. Walker recently delivered a course of lectures on sanitation at the Teachers' College, Columbia University, New York City.— Florence Marion Loughton, M.D., who took special work with the class and later

graduated elsewhere in medicine, was physician at the New England Hospital for Women and Children, Boston, in 1898 and 1899, and is now a member of the Vanderbilt Clinic, as well as engaged in general practice in New York City.—James A. Emery, of the firm of Emery & Crump, street railway engineers, is at present in charge of the construction of the Atlanta Rapid Transit Lines, Atlanta, Ga.—Walter I. Swanton has resigned his position as bridge inspector of the Boston & Albany Railroad to enter the employ of the Union Bridge Company at Athens, Pa., as draughtsman.—John Ormsbee Ames, of Providence, R.I., served during 1898 and 1899 as first lieutenant, commanding Company A, First Regiment Infantry, Rhode Island militia. The following are some of the other organizations of which Ames is a member: Hope Club, Agawam Hunt Club, Rhode Island Society of Cincinnati, and the Delta Psi Fraternity.—Harry M. Latham has recently associated himself with the engineering department of the American Steel and Wire Company at Worcester, Mass.

1894.

W. E. PIPER, *Sec.*

Fells, Mass.

B. S. Harrison has opened an office for himself as architect at Lacrosse, Wis.—J. Calvin Locke was married to Miss Lillian Green on November 22, 1899, at Brooklyn, N.Y.

1895.

E. H. HUXLEY, *Sec.*

29 Hampshire St., Camb' port, Mass.

John Dyer, Jr., is in the firm of Denniston & Dyer, building and contracting business. The firm is engaged at present on government buildings at army posts.—Azel Ames, Jr., announced his engagement recently.—A. D. Fuller sailed for Europe in January, where he goes as engineer in charge of the Massachusetts State Exhibit at the Paris Exposition.—The secretary urges a prompt response to his notice of assessment. The Association of Class Secretaries has levied an assessment on all the classes, which renders further funds necessary.—A plan has been suggested for the Boston mem-

bers of the class to meet informally at dinner, and to have the representatives in the different cities to meet on the same night, and possibly have a short telephone conversation between the various organizations. If any support is given to the scheme, it may be successfully tried.—Clifford B. Sanborn has opened a law office in the Niles Building, Boston.—Luther Conant, Jr., is now editor of "Outside Securities," *Journal of Commerce and Commercial Bulletin*, Nos. 17 and 19 Beaver Street, New York, N.Y.

1896.

F. E. GUPTILL, Sec.

71 Newbury Street, Boston.

William H. McAlpine has been appointed hydrographer in the United States Navy on United States steamship "Ranger," connected with the Mare Island Navy Yard.—On Wednesday evening, January 24, 1900, at the First Church of Christ, Springfield, Mass., Alice Billings Mayo was married to Harry George Fisk. Mr. and Mrs. Fisk will reside at 367 Union Street, Springfield.—G. C. Hall, who until

recently has been with the Electric Railway Company of Chicago, has returned to Boston, and is with Stone & Webster, electrical engineers, 4 Post-office Square.—William H. Clifford, of Portland, Me., who is a first lieutenant in the United States Marine Corps, is in the Philippine Islands, where he will probably remain for another year.—George E. Merryweather sailed about the middle of February for Paris, where he is to represent the Browne & Sharpe Manufacturing Company of Providence at the Exposition.—Lambert N. Whitney was in Boston in February from New York.—H. F. Hawley, formerly at 11 Mt. Vernon Street, is now in Baldwinsville, N.Y.—There were twenty-three members present at the class dinner held on the 16th of February at Hotel Brunswick. Rockwell presided. Toasts were responded to by Smalley, Tyler, Knight, and Ames; and each member contributed a few words as he was called on by the toastmaster. Music, etc., were on tap during the evening; and everybody appeared to enjoy himself.—R. F. Portner died January 23, 1900.

1897.

JOHN A. COLLINS, JR., *Sec.*

55 Jackson Street, Lawrence, Mass.

E. P. Mason has been transferred from the experimental department of Draper Company to the position of travelling salesman.—Elmer L. Gerber is acting as instructor in architectural drawing at the Y. M. C. A. in Dayton, Ohio.—Frank H. Keisker has become a member of the T-Square Club of Philadelphia.—Charles L. W. Pettee, formerly with the Pope Manufacturing Company of Hartford, is now associated with Henry Souther, '87, in doing metallurgical work.—Irenée du Pont is treasurer of the Manufacturers' Contracting Company of Newark, N.J. He was married on Thursday, February 1, to Miss Irene du Pont, of Wilmington, Del.—Proctor L. Dougherty, who has recently gone into the office of the Supervising Architect, Washington, D.C., read a paper a short time since before the Washington Architectural Club on "Decorative Illuminations."—William K. Fairbanks acted as representative of the Clinton Wire Cloth Company at the

National Export Exposition, Philadelphia.—Ralph A. Bowen was married on August 9, 1899, to Miss Dorice Eugénie L'Hommedieu. Mr. Bowen is manager of the New York office of Charles S. Norton, importer of aniline colors and dyestuffs.—Otto S. Pike, II., was married on October 3 to Miss Millie T. Killam, of Malden. He is at present connected with the Boston Pneumatic Transit Company.—Frank W. Everett, VI., has left the Union Iron Works to establish the firm of Field & Everett, engineers, with offices in New York City.—Oswald C. Hering, IV., with his fiancée, Miss Anna Linderfeldt of Paris, visited Boston recently. He will do architectural work in New York this winter.—E. C. Jacobs, III., has just received and accepted a call from the University of Vermont to fill a place as instructor of chemistry, mineralogy, and assaying.—F. L. Edmands has accepted a position as assistant examiner in the Patent Office.—W. O. Sawtelle is teaching mathematics and physics in the Bangor High School.—Mr. Walter B. Russell, assistant in mechanical engineering, was re-



cently associated with R. S. Hale, of Boston, in preparing a paper read before the American Society of Mechanical Engineers. The title of the paper was "Boilers and Furnace Efficiency."—E. B. McCormick was married on December 26 to Miss Jeanette Maxey, of Bozeman, Mont. Mr. McCormick is teaching engineering in the Montana State College.—A. H. Nelson has been made a director of the Pittsburg Bridge Company.—The engagement is announced of John A. Collins, Jr., to Miss Mabel C. Fisher, of Newtonville, Mass.

1898.

CHAS.-E. A. WINSLOW, *Sec.*

Hotel Oxford, Boston.

Frank B. Heathman, of Dayton, Ohio, was married on Tuesday, November 14, to Miss Grace L. Brooks (Smith, '97), of Roxbury. Mr. Rudolph Tietig, of Cincinnati, was the groom's best man.—There is a colony of '98 architects in Paris this winter, including H. P. Richmond, G. P. Stevens (who holds the Swett Fellowship), J. H. House, and H. C.

Ingalls.—W. D. Hubbard has a permanent position as superintendent of the new Concord Sewerage System, upon the construction of which he and W. B. Wood have been engaged. It is rumored that Hubbard is to be married in the fall.—W. E. Putnam, Jr., has opened an office as practising architect at 1 Somerset Street, Boston. He is at present engaged with designs for extensive alterations in an office on the corner of Somerset Street and Beacon.—L. D. Peavey has returned from New York to take a position with the New England Structural Company of Everett, Mass.—W. L. Butcher is now in the Engineering Department of the Massachusetts State Board of Health.—B. A. Adams has been appointed superintendent of manual training at Talladega College, Talladega, Ala.—C. J. Skinner, who was engaged during the summer of '99 on the construction of the Blackwell Branch of the Atchison, Topeka & Santa Fé Railroad in Oklahoma, has been suffering from a severe attack of typhoid fever, from which he has but recently recovered.—C. Le Moyne is at Idaho City,

Idaho, with the Boston and Idaho Gold Dredging Company, working with a new method of mining placer gold.—J. S. Bleecker made a great hit as Queen Anne of Austria in the 1900 Cadet play, "Miladi and the Musketeer."—E. M. Taylor has been recently engaged in putting a 15-inch coast defence dynamite gun battery in place at Fisher's Island, N.Y.—R. E. Wilder has been advanced in rank as a draughtsman engaged on mill building construction with the Cambria Steel Company at Johnstown, Pa.—E. R. Butterworth announces his engagement to Miss Mary Baldwin Reed, of Somerville, Mass.—D. L. Wing has relinquished the lumber business to take a position in the Census Bureau at Washington, D.C.—F. A. Jones is practising as a civil engineer at Kenyon, Minn.—G. B. Pillsbury will graduate from West Point in June.—T. E. Tallmadge and R. S. De Golyer are both with D. H. Burnham & Co., architects, of Chicago. Tallmadge's old friends who have not heard a word from him since graduation may be glad to know that he is said to be doing well.—G. F.

Ulmer has been promoted from the position of assistant chemist to that of chemist, with the Arbuckle Sugar Refining Company. He is arranging to have an informal reunion of the '98 men in New York during the spring.—P. H. Lombard left the Bell Telephone Company of Philadelphia last fall to take a position with the General Electric Company of Schenectady.—R. E. Kendall was married on October 4, 1899, to Miss Henrietta Frame Shattuck, of Hyde Park, Mass.—G. R. Davison is a member of the Peabody Board of Trade.—A. F. Howard is with the Portsmouth (N.H.) Electric Railway as electrical engineer on construction and assistant superintendent in the operation of the road.—F. E. Coombs has given up professional work in architecture, and is now interested in building materials, especially various burned clay products.—W. White is with a powder manufacturing company at South Amboy, N.J.—W. L. Learned is with the Metropolitan Sewerage Commission at 1 Mt. Vernon Street, Boston.—'98 men in the neighborhood of Boston held a pleasant informal

reunion at the Technology Club on the evening of March 27.

1899.

WALTER O. ADAMS, *Sec.*

1776 Mass. Ave., N. Cam., Mass.

Arthur Hamilton has lately gone to Montana to take the position of chemist with the Boston & Montana Smelting & Refining Company at Great Falls.—Ted Hammond has left the Edison Laboratory to accept a position with W. F. Jobbins at Aurora, Ill.—In the recent Cadet play, "Miladi and the Musketeer," '99 had three representatives, Frederic B. Stearns, "Tim" Hoxie, and Walter Adams. Tim made a corking girl.—A committee has been appointed by the secretary to engineer the collection of subscriptions from '99 for the Walker Memorial Fund. Over two hundred dollars has already been subscribed, and good progress is daily being made.—Monthly

dinner is being held by the fellows living in or near Boston. They are very informal, beginning about six and ending in time for the theatre. The men come in directly from business, without the preliminary fussiness generally attending more pretentious affairs. The secretary will be glad to furnish particulars to any one not already having received notice.—Percy W. Witherell is with Warren F. Witherell, grocer, Boston, Mass.—B. P. Hazeltine is working in the draughting-room of the National Tube Works at McKeesport, Pa.—A. F. Nathan is working for the American Mining Company at Joplin, Mo.—W. Malcolm Corse is with W. S. Merrell Chemical Company, Cincinnati, Ohio.—Charles Barnard Page is in the shop of the Maryland Steel Company at Sparrows Point, marking out work for all the machine tools. He is now getting out the machinery and structural parts for four new U.S. torpedo-boat destroyers.

## REVIEWS

## THE TECHNOLOGY QUARTERLY

The thirteenth volume of the TECHNOLOGY QUARTERLY commences with the issue for March. This number contains "Proceedings of the Society of Arts, October to December, 1899"; "New Cellulose Industries," by Mr. A. D. Little; "Character and Extent of Food and Drug Adulteration in Massachusetts and the System of Inspection of the State Board of Health," by Mr. Albert E. Leach; "The Temperatures at which Certain Ferrous and Calcic Silicates are formed in Fusion and the Effect upon these Temperatures of the Presence of Certain Metallic Oxides," by Professor H. O. Hofman; "Review of American Chemical Research."

## OUTLINES OF INDUSTRIAL CHEMISTRY

BY FRANK HALL THORP, Ph.D. (M. I. T. '89), Instructor in Industrial Chemistry in the Massachusetts Institute of Technology. New edition, revised. 541 pp. New York, the Macmillan Company, 1899.

It is gratifying to note that a second edition of this text-book is already called for, indicating that the results of the labor involved in this compilation of material have been appreciated by teachers and students of industrial chemistry. The changes made in the present edition are in the nature of corrections, or modifications of details, and do not alter its general character. A new diagram indicating the successive processes which go on in a sulphuric acid chamber has been introduced; a description of the Herreshoff pyrite burner replaces that of one of the older forms; the cell used in the Le Sueur process is now described, the data not being previously available; some changes have been made in the discussion of fats, oils, and soaps; and, in general, the minor errors

throughout the text have been corrected. It is to be hoped that Dr. Thorp will soon find it practicable to make such additions to the bibliographies as will bring them more closely up to date than is at present the case.

H. P. T.

VICTOR VON RICHTER'S ORGANIC CHEMISTRY

VOL. II. CARBOCYCLIC AND HETEROCYCLIC SERIES. Edited by Professor R. ANSCHÜTZ, University of Bonn, assisted by Dr. G. SCHROETER. Authorized translation by EDGAR F. SMITH, Professor of Chemistry, University of Pennsylvania. Third American from the Eighth German edition. 671 pp. Philadelphia, P. Blakiston's Son & Co., 1900.

It is noted in the preface of this edition that in the preparation of the German edition, of which it is a translation, Professor Anschütz availed himself of the services of those of his colleagues who were best fitted to speak with an authority born of experience in the field included in the various chapters, and that on this account the work may be regarded as particularly trustworthy. As the work of the translator appears to have been faithfully and thoroughly done, the American edition possesses the same authoritative character. The indexing appears also to have been done with great care,—a point which counts for much in a book which contains such a quantity of material, in such condensed form, as is the case here. As a reference book, Richter's chemistries have long proved themselves of value; and the present volume is entitled to be ranked with the others which have preceded it.

H. P. T.

INTRODUCTION TO PHYSICAL CHEMISTRY

BY JAMES WALKER, D.Sc., Ph.D. Macmillan & Co., New York and London, 1899.

The appearance of an English work on Physical Chemistry by one who has long identified himself with this new branch of science, not only by his own investigations, but also by his well-known translation of Ostwald's "Outlines of Physical Chemistry"

and of his "Physico-chemical Measurements," will be hailed with delight by English-speaking teachers as well as students. While the advanced student of Physical Chemistry has had his needs for text and reference books amply met by Ostwald's classical "Lehrbuch" and Nernst's admirable "Theoretische Chemie," the beginner has been obliged to fall back upon Ostwald's elementary treatise, which, being a very abbreviated edition of the "Lehrbuch," is not well adapted to the needs of a student approaching the subject for the first time. Dr. Walker's book fills, therefore, a real need in our chemical literature, the more felt as instruction in this subject is finding a more and more important place in the curriculum of all our leading universities and colleges.

As to the book itself, the author states that it "makes no pretension to give a complete or even systematic survey of Physical Chemistry." And so it is perhaps unfair to make the chief criticism one is tempted to make of the work; *i.e.*, the lack of system and unity which impresses one in going from chapter to chapter. But the matter which is treated of is discussed admirably and at sufficient length to be readily understood by one familiar with elementary physics and chemistry, a knowledge of which is assumed. Only the most elementary mathematics is introduced, the few thermo-dynamical proofs involved being collected together in a concluding chapter.

The treatment is thoroughly up to date; and the author, being a strong advocate of the dissociation theory, has presented this most important subject with a chapter on its numerous applications in a most satisfactory manner. Special mention may also be made of the chapters on chemical equilibrium and chemical dynamics. Electro-chemistry, excepting that portion dealing with the dissociation theory and electrolytic conduction, and photo-chemistry are not treated. The references given at the end of the chapters, for the convenience of those desirous of obtaining further information, might have been extended to good advantage; for the author, in his selection, evidently had in mind English students for whom the German language has no attractions. The book is most heartily recommended to all interested in the modern aspect of theoretical chemistry.

H. M. GOODWIN.

## IRRIGATION AND DRAINAGE

By F. H. KING, Professor of Agricultural Physics in the University of Wisconsin. New York, the Macmillan Company.

No one at all interested in the scientific development of agriculture, and especially of that branch which depends upon artificial irrigation, will readily lay down this book after once having taken it up. Its aim is to show the fundamental relations of water to the soil and to plants, and upon the knowledge of those relations to develop a logical practice in land irrigation and drainage. Interesting experiments are recounted by which was determined the actual amount of water required by various growing plants. A thorough discussion is given of the extent to which tillage may take the place of irrigation by conserving soil moisture, as also of the increase of yield under irrigation in humid climates. How plants are believed to supply themselves with moisture from the soil and how they extend their roots into the soil are explained. Consideration is given to the serious problems presented by the development of alkali salts in irrigated lands, and the proper remedy is pointed out. In fact, there seem to be few questions likely to come to the mind, and fairly within the scope of the work, upon which it does not cast light.

No assumption is made of dealing largely with engineering principles or problems. The book does, however, give an excellent outline of the constructions and mechanical devices used in diverting and in raising water for irrigation. Further, the matter of drainage is most admirably presented; and no engineer who has to deal with problems either of ordinary land drainage or of drainage in connection with sewage disposal can fail to find this part of the work of decided value to him. How drainage ventilates the soil, how it increases the available supply of soil moisture for crops, and how it acts to make the soil warmer are made clear. The principles governing ground-water flow and its entrance into subsoil drains, about which many vague and even erroneous views are unquestionably held, are well stated, and are plainly illustrated

by diagrams based upon observations in test-wells. Very complete practical directions are also given for the construction of pipe systems for land drainage.

The novelty of many of the illustrations attracts the eye. One view shows a field served by sub-surface irrigation, and reveals the difficulty experienced in thoroughly wetting the surface soil in such treatment; another, the raising of water from the Grand River, Colorado, through a height of more than eighty feet, by the unusual arrangement of two centrifugal pumps, one above the other, in series; while a third portrays irrigation by sewage on the Craigen-tinny meadows about Edinburgh, a load of more than a ton of grass in the foreground representing a single cutting from only a sixteenth part of an acre of this land. The model garden used in Paris to illustrate what may be accomplished in the utilization of sewage as it is applied by that city upon the sandy fields along the Seine, the penetration of roots into the soil, the contrast presented by a field partly under irrigation and partly without that aid, and numerous views illustrating the diverse methods used in applying water are among the features set forth in the large number of photo-engravings which the book contains. These are necessarily small, and some have suffered in clearness in reproduction; but, on the whole, they contribute greatly to the interest of the reader.

This book forms the eighth in the Rural Science Series, to which Professors Brewer, of Yale, Roberts, of Cornell, Hilgard, of California, and various other authorities of the highest reputation are set down as contributors. Its matter is presented with great clearness, and its conclusions are largely based upon a study of careful experiments and upon personal inspection of irrigation practice both in this country and abroad. In its preparation the author has performed a valuable service.

DWIGHT PORTER.



## THE RISE AND DEVELOPMENT OF THE LIQUEFACTION OF GASES

By WILLETT L. HARDIN, Ph.D. Macmillan Company, 1899.  
\$1.50.

This volume is divided into four chapters, corresponding to four periods in the development of the liquefaction of gases. The first chapter treats of the early observations on the compression of gases and the few attempts on their liquefaction. The second chapter is devoted to a review of the work of Faraday and other experimenters during the period 1820-1870, and also records the successful liquefaction and solidification of certain gases. The work of Andrews, on the relation of the critical constants, pressure, volume, and temperature to the liquefaction of gases and a general discussion of the continuity of the gaseous and liquid states, form the subject-matter of the third chapter.

The fourth chapter is divided into four sections: —

1. Experiments of Cailletet and Pictet on the liquefaction of the so-called permanent gases. 2. The experiments of Wroblewski, Olszewski, and Dewar. 3. Liquefaction of gases by the regenerative method. 4. Liquefaction of argon, hydrogen, helium, krypton, etc.

Throughout the volume, references to the original publication in the foreign journals are given. To those who are not in a position to consult the original literature, the book offers a history of the development of the methods employed in liquefaction of gases, together with a statement of the underlying principles.

G. V. W.

## PUBLICATIONS OF THE INSTITUTE

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